OVERSIGHT AND MANAGEMENT OF DEPARTMENT OF ENERGY NATIONAL LABORATORIES AND SCIENCE ACTIVITIES

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

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OVERSIGHT AND MANAGEMENT OF DEPARTMENT OF ENERGY NATIONAL LABORATORIES AND SCIENCE ACTIVITIES

THURSDAY, JULY 11, 2013

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Subcommittee met, pursuant to call, at 9:56 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Cynthia Lummis [Chairman of the Subcommittee] presiding.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives
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Subcommittee on Energy

Oversight and Management of Department of Energy National Laboratories and Science Activities

Thursday, July 11, 2013
9:30 a.m. – 11:30 a.m.
2318 Rayburn House Office Building

Witnesses

Mr. Matthew Stepp, Senior Policy Analyst, Information Technology and Innovation Foundation

Mr. Jack Spencer, Senior Research Fellow, The Heritage Foundation

Dr. Thom Mason, Director, Oak Ridge National Laboratory

Dr. Dan Arvizu, Director, National Renewable Energy Laboratory

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY

HEARING CHARTER

Oversight and Management of Department of Energy National Laboratories and Science Activities

Thursday, July 11, 2013
9:30 a.m. – 11:30 a.m.
2318 Rayburn House Office Building

PURPOSE

The Subcommittee on Energy will hold a hearing entitled *Oversight and Management of Department of Energy National Laboratories and Science Activities* on Thursday, July 11, at 9:30 a.m. in Room 2318 of the Rayburn House Office Building. The purpose of the hearing is to examine the Department of Energy's (DOE) oversight and management of science and technology activities, particularly as they relate to enhancing the efficiency and effectiveness of the National Laboratory System. The hearing will consider ideas and recommendations regarding how best to enhance DOE support of science and innovation through reforms in areas related to management, performance, technology transfer, and laboratory authorities and regulations.

WITNESS LIST

- **Mr. Matthew Stepp,** Senior Policy Analyst, Information Technology and Innovation Foundation
- **Mr. Jack Spencer,** Senior Research Fellow, The Heritage Foundation
- **Dr. Thom Mason,** Director, Oak Ridge National Laboratory
- **Dr. Dan Arvizu,** Director, National Renewable Energy Laboratory

BACKGROUND

History[1]

The origins of DOE's national laboratories and the Office of Science trace back to World War II and the Manhattan Project, as the pursuit of the world's first nuclear weapon spawned a

[1] Any information in the history section is largely drawn from or paraphrased from the DOE Office of Science page on history. Accessible at: http://science.energy.gov/about/history/

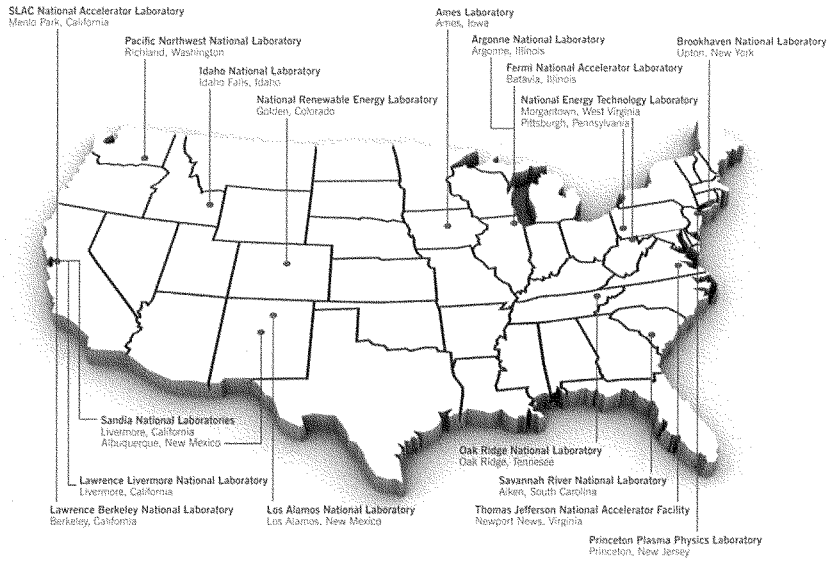
vast research and development apparatus. The national labs grew out of the large multi-purpose facilities that housed this early scientific work. Post-World War II, the broader national importance of these scientific and technical capabilities was clear, though debate remained regarding whether or not they should remain predominantly military-focused. In 1946, the Atomic Energy Act was passed, and responsibility for nuclear research and development was transferred from the War Department to a new independent civilian agency, the Atomic Energy Commission (AEC).

The AEC created a network of national laboratories throughout the 1940s and 1950s, and these labs constructed and operated particle accelerators, colliders, centrifuges, and other tools to advance nuclear science. During the following decades, the number of these facilities increased, and their scope and capabilities became increasingly diversified to include physics, fusion, and advanced computing, among other issues. These facilities were largely utilized in support of Cold War and national security objectives. In 1971, President Nixon expanded the AEC research charter to include non-nuclear forms of energy and related technologies, and in the following years, the AEC transitioned into the newly-created Energy Research and Development Administration (ERDA). In 1977, President Carter signed the Department of Energy Organization Act, which consolidated most of government's energy-related research—including ERDA—under the newly-created Office of Energy Research, later renamed the Office of Science, to house the DOE's basic research portfolio.

Today, the DOE lab system is comprised of 17 national laboratories that provide the country with strategic and foundational scientific and technological capabilities (figure 1). The combined direct DOE funding for the laboratories is over $11 billion, representing nearly 40 percent of the Department's entire budget (appendix I). Of the agency's 17 facilities, the following 10 are managed by the Office of Science (SC) and primarily support basic research and major scientific user facilities: Ames, Argonne, Brookhaven, Fermi, Lawrence Berkeley, Oak Ridge, Pacific Northwest, Princeton Plasma Physics, SLAC National Accelerator Laboratory, and Thomas Jefferson National Accelerator Facility.[2] The remaining seven labs specialize in nuclear energy (Idaho, Savannah River), Fossil Energy (National Energy Technology Laboratory), Energy Efficiency and Renewable Energy (National Renewable Energy Laboratory), and national security and weapons management (Sandia, Lawrence Livermore, and Los Alamos).

[2] Department of Energy, Office of Science, Laboratories. Accessible at: http://science.energy.gov/laboratories/

Figure 1. The DOE Laboratory System



Current Issues

In recent years, questions have arisen as to whether or not the labs, and DOE's management of them, can and are successfully moving past their Cold War roots and adapting to address the challenges of the 21st century. Concerns with the management structure and performance at the national labs were reflected in the DOE's FY 2012 Appropriations Bill. To better understand the potential management and performance challenges facing the labs, the bill directed the National Academy of Public Administration (NAPA) to conduct an independent review of DOE management and oversight. Specifically, the report was to respond to congressional questions concerning whether or not DOE's oversight model allows the national labs sufficient flexibility to optimize performance, whether DOE's lab oversight is adequate, and whether DOE's lab evaluation processes measure the appropriate metrics and hold labs accountable for performance.

The report, entitled *Positioning DOE's Labs for the Future: A Review of DOE's Management and Oversight of the National Laboratories*, was released in January of this year.[3]

[3] A Report by a Panel of the National Academy of Public Administration for the U.S. Congress and the Department of Energy, Positioning DOE's Labs for the Future: A Review of DOE Management and Oversight of the National

The report is largely supportive of DOE efforts to move to a performance-based oversight model and an outcome-based evaluation approach, but identified challenges that must be addressed in order to strengthen this transition. With regard to lab management, the report found that "New management approaches are needed to address changing conditions and drive the lab complex to optimize its future contribution to the Nation's energy and security goals."[4] Notably, the report found that if DOE is to successfully transition to a Contactor Assurance Systems (CAS)-based oversight model and a more outcome-based evaluation approach, DOE staff in headquarters and at site offices must also change the way they conduct business. This includes transitioning to a systems approach to managing the labs which will require DOE leadership and staff involvement in order to change the attitude and culture surrounding lab management and oversight.

The authors of the NAPA report acknowledged that its release came at a time of "leadership transition at DOE" and expressed their hope that the Department would take the opportunity to develop new strategies regarding the future of the national labs.[5] Accordingly, on May 16, 2013 Dr. Ernest Moniz was unanimously confirmed by the Senate as the 13th Secretary of Energy. During his confirmation hearing before the Senate Committee on Energy and Natural Resources, Dr. Moniz expressed his support of and appreciation for the basic research and fundamental science conducted at the national labs, but stated that he planned to work with the laboratory directors in a "somewhat different" way than his predecessor and that he hoped to improve the way that the labs engage with the Department. [6]

In testimony before the Committee on Science, Space, and Technology on June 18th, Secretary Moniz announced he was in the process of finalizing a number of management and performance reforms to enhance organizational efficiencies and programmatic oversight and accountability, stating that "management and performance of the Department is one of my top priorities as Secretary."[7] (See Appendix II.)

On June 19th, the Information Technology and Innovation Foundation (ITIF), Heritage Foundation, and Center for American Progress (CAP) released a joint report entitled *Turning the Page: Re-imagining the National Labs in the 21st Century Innovation Economy.*[8] The report examines the DOE-National Lab model with an eye toward effectiveness in meeting and addressing the challenges of the 21st century, and suggests various recommendations designed to move the model past its Cold War roots. In particular, the report emphasizes that in order for the

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Laboratories, January 2013. Accessible at: http://www.napawash.org/wp-content/uploads/2013/01/DOE-FINAL-REPORT-1-2-13.pdf

[4] Ibid.

[5] Ibid.

[6] Hearing before the Committee on Energy and Natural Resources, United States Senate, *Moniz Nomination*, April 9, 2013. P. 41-42. Accessible at: http://www.gpo.gov/fdsys/pkg/CHRG-113shrg80930/pdf/CHRG-113shrg80930.pdf

[7] http://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-113-SY-WState-EMoniz-20130617.pdf

[8] *Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy*, June 2013. Accessible at: http://www2.itif.org/2013-turning-page-national-lab-innovation-economy.pdf

labs to still advance 21st century innovation and technology, they must embrace changes to the lab management model. The report made the following comprehensive recommendations to enhance lab oversight and performance:

Transforming Lab Management From DOE Micromanagement to Contractor Accountability

- Creation of a high-level task force to develop DOE-actionable reforms on lab effectiveness and accountability.
- Transition to a performance-based contractor-accountability model.
- Expand the Performance Evaluation Management Plan process to include a new accountability model.

Unifying Lab Stewardship, Funding, and Management Stovepipes with Innovation Goals

- Merge the existing Under Secretaries of Science and Energy into a new Office of Science and Technology.
- Combine the research functions of the Office of Science and those of the Under Secretary for Energy under a new Office of Science and Technology.
- Remove top-down overhead accounting rules.

Moving Technology to Market with Better Incentives and More Flexibility

- Expand Agreements for Commercializing Technology (ACT) agreements.
- Allow labs to use flexible pricing for user facilities and special capabilities.
- Allow labs autonomy in nonfederal funding-partnership agreements.
- Add weight to technology transfer in the expanded PEMP process.
- Execute consistent guidelines on conflicts of interest.

This hearing will examine the recommendations of the ITIF/Heritage/CAP report as well as related recommendations pertaining to improving the function of DOE science and technology activities, particularly as they relate to the national laboratories.

Appendix I: DOE National Laboratory Spending

National Laboratory	FY 2012	FY 2013 Annualized CR	FY 2014 Request
Ames Laboratory	$30,304	$50,528	$50,544
Argonne National Laboratory	$610,684	$595,865	$556,441
Brookhaven National Laboratory	$625,266	$627,748	$564,790
Fermi National Accelerator Laboratory	$408,417	$410,929	$406,667
Idaho National Laboratory	$1,066,968	$1,029,671	$954,911
Lawrence Berkeley National Laboratory	$614,173	$608,565	$566,763
Lawrence Livermore National Laboratory	$1,314,330	$1,188,579	$1,137,792
Los Alamos National Laboratory	$2,005,067	$1,826,850	$1,962,384
National Energy Technology Lab	$705,740	$708,619	$615,372
National Renewable Energy Laboratory	$266,623	$234,282	$292,091
Oak Ridge National Laboratory	$1,155,756	$1,115,492	$1,092,665
Pacific Northwest National Laboratory	$534,940	$508,995	$478,302
Princeton Plasma Physics Laboratory	$79,007	$79,486	$65,642
Sandia National Laboratories	$1,649,985	$1,807,095	$1,814,638
Savannah River National Laboratory	$4,991	$18,049	$18,096
SLAC National Accelerator Laboratory	$333,156	$334,693	$411,261
Thomas Jefferson National Accelerator Facility	$160,342	$161,323	$163,482
TOTAL	**$11,565,749**	**$11,306,769**	**$11,151,841**

Appendix II: Relevant Excerpt from Secretary Moniz's June 18th, 2013 Testimony

Management and Performance

The Department of Energy has a broad range of responsibilities that stretch across cutting edge science and technology programs, national security priorities, and complex environmental cleanup projects. Responsibility for taxpayers' money demands that we manage our resources in the most efficient manner possible. Improving the management and performance of the Department is one of my top priorities as Secretary.

I have been carefully reviewing the organization and management practices within the Department and am working with my staff to develop options to reorganize. I see this as a sustained effort for continuous improvement and I look forward to working with members of this committee and others in Congress and the Administration to elevate the focus on management and performance at DOE.

As part of this process, I have identified several areas where I plan to make improvements:

- To better support the President's all-of-the-above energy strategy, we need to improve the Department's systems approach to energy policy analysis. DOE has analysis capabilities housed in each major program area, but to strengthen our integrated policy assessment capability to provide the Secretary, the President, and the Congress with comprehensive assessments of key energy policy issues, I am considering plans to consolidate and strengthen policy and systems analysis, to make better use of existing resources.

- A key factor in successful technology innovation programs is the ability to closely integrate and move quickly from basic science, to applied research, to technology demonstration. The Department has made important strides to foster communication between its science and energy programs, but we must do more organizationally to drive this process. I am considering ways to more closely integrate the management of science and energy programs to improve the dexterity and effectiveness of the innovation process.

- We need to build consistency and accountability across the entire Department. The various mission support functions of DOE require greater day-to-day oversight, coordination and integration. I am considering means of strengthening the lines of authority and management of these functions.

- Finally, I am examining the organization of the Office of the Secretary. I look forward to building councils of advisors that will provide enterprise-wide advice and analysis on issues ranging from cyber security to the management of the National Labs. I also plan to engage the Directors of the National Laboratories regarding the Department's mission and to appoint new members to and work closely with the Secretary of Energy Advisory Board. Bringing together these measures to improve internal coordination and reaching out for expert outside advice will provide me with a broader base of information and analysis to make informed decisions.

Chairman LUMMIS. Well, we are, as I said, going to dispense with some of the formalities. The Ranking Member just walked in and we are delighted you are here this morning.

Welcome to today's Energy Subcommittee hearing entitled "Oversight and Management of Department of Energy National Labs and Science Activities." Last month, we held a Full Committee hearing with our new Energy Secretary Ernest Moniz. At the hearing, Secretary Moniz announced that he would be undertaking a number of management and performance reforms aimed at enhancing the Department's organizational effectiveness and programmatic oversight and accountability.

So we are really excited about this undertaking, and the primary purpose of today's hearing is to receive testimony on the specific reforms that Congress and the Administration may be able to work together to advance.

I am going to take the remainder of my opening remarks and submit them for the record and waive the remainder of my opening remarks for the record and ask our Ranking Member, Mr. Swalwell of California, if he has any opening remarks and then we can get right into your testimony so we don't get interrupted by our next round of votes. Mr. Swalwell?

[The prepared statement of Mrs. Lummis follows:]

PREPARED STATEMENT OF SUBCOMMITTEE CHAIRMAN CYNTHIA LUMMIS

Good morning and welcome to today's Energy Subcommittee hearing entitled Oversight and Management of Department of Energy National Laboratories and Science Activities.

Last month, we held a Full Committee hearing with newly minted Energy Secretary Ernest Moniz. At the hearing, Secretary Moniz announced that he would be undertaking a number of management and performance reforms aimed at enhancing the Department's organizational effectiveness and programmatic oversight and accountability.

We very much welcome this undertaking, and the primary purpose of today's hearing is to receive testimony on the specific reforms that Congress and the Administration may be able to work together to advance.

On the same week of Secretary Moniz's announcement, three think tanks—the Information Technology Innovation Foundation, the Heritage Foundation, and the Center for American Progress—released a report entitled Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy. Perhaps ironically, one does not have to turn a single page to be intrigued by this report. The simple fact that the Heritage Foundation and Center for American Progress were able to agree on anything, much less a detailed 70-page report, is a pleasant reminder that even in the current polarized environment, opportunities for bipartisan policy improvements exist.

The Reimagining report includes a bevy of bold recommendations, including ideas to reduce bureaucracy and micromanagement, enhance technology transfer, and change DOE's organizational structure and fundamental relationship with the National Labs. The national laboratories collectively manage more than $10 billion of scientific and national security activities, and major changes such as those being proposed by outside stakeholders as well as the Obama Administration warrant complete and thoughtful consideration.

Beginning with their roots in providing the scientific foundation upon which America won World War II and the Cold War, the national labs have a rich and often underappreciated history. Today, the labs' role in sponsoring cutting-edge basic research and managing world-class user facilities is a driving force behind the United States' global scientific leadership and economic competitiveness. I look forward to learning how we can best sustain and advance their important contributions to the country.

To this end, Ranking Member Swalwell and I wrote Secretary Moniz requesting his feedback on the recommendations of the Reimagining report. We received his response last night, which I would like to enter into the record [without objection].

I want to commend the Secretary for his prompt response, and note that we also look forward to hearing his own forthcoming reform ideas.

Ultimately, it is my hope that through our discussion today and in the coming weeks, we can begin to identify areas of agreement that will positively benefit DOE's science enterprise.

Thank you and I yield back.

Mr. SWALWELL. Sure. Thank you, Chairman Lummis, for holding this hearing today. And I want to thank our witnesses for being here.

I represent a district in northern California that has two national laboratories, Sandia and Lawrence Livermore, and also my colleague Ms. Lofgren from the Silicon Valley area also just outside her district but has been a faithful advocate for those laboratories as well, which I am always grateful to have an ally as a neighbor.

And just want to highlight that these laboratories employ many of our country's brightest minds in science and engineering and they continue to inspire, train, and support new generations of American researchers and industry leaders. They also serve as an important path by which new technologies can move to market in ways that benefit its public and private partners alike and in turn the American taxpayer.

And while it is important to recognize the great work being done across the country by our national labs, as other researchers supported by the Department of Energy programs, it is equally important to consider what opportunities exist to make improvements. And that is why I look forward to today's hearing and for one example I wanted to highlight was the recommendation in the report to merge the Department's Under Secretary for Energy and Under Secretary for Science into a single Under Secretary for Science and Technology, which I believe makes a lot of sense as it would finally establish a single individual in DOE with both the sole responsibility and authority to advance new energy technologies from basic research through commercialization activities.

This report also recommends a number of interesting ways that we may be able to accelerate technology transfer and improve the efficiency and effectiveness of our labs and I look forward to exploring these ideas further with our DOE laboratory witnesses shortly. And also just about a three iron outside my district is the Berkeley National Lab—Lawrence Berkeley National Laboratory as well and I appreciate their staffs' effort to continue to update and educate me on the great work they are doing there.

So thank you for holding this hearing, Chairman Lummis. And with that, I yield back the balance of my time.

[The prepared statement of Mr. Swalwell follows:]

PREPARED STATEMENT OF SUBCOMMITTEE RANKING MEMBER ERIC SWALWELL

Thank you Chairman Lummis for holding this hearing today, and I also want to thank the witnesses for being here.

It is no secret by now that I am a major supporter of the Department of Energy's national laboratories, even a few of the ones that aren't in my District. These labs carry out world-class research on issues of national and global importance, they employ many of our country's brightest minds in science and engineering, and they continue to inspire, train, and support new generations of American researchers and industry leaders. They also serve as an important path by which new technologies can move to market in ways that benefit its public and private partners alike, and in turn, the U.S. taxpayer.

While it is important to recognize the great work being done across the country by our national labs as well as other researchers supported by Department of Energy programs, it is equally important to consider what opportunities exist to make improvements.

That is why I am excited to learn more about these ideas and opportunities at today's hearing. For example, one of the recommendations in this report is to merge the Department's Under Secretary for Energy and Under Secretary for Science into a single Under Secretary for Science & Technology, which I believe makes a lot of sense as it would finally establish a single individual in DOE with both the sole responsibility and authority to advance new energy technologies from basic research through commercialization activities. The report also recommends a number of interesting ways that we may be able to accelerate technology transfer and improve the efficiency and effectiveness of our labs, and I look forward to exploring these ideas further with our DOE laboratory witnesses shortly.

Chairman LUMMIS. Thank you. If there are any other Members who wish to submit additional opening statements, your statements will be added to the record at this point. Anyone?

Chairman LUMMIS. Thank you. Well, now, we will introduce our witnesses. Our first witness today is Mr. Matthew Stepp, Senior Policy Analyst with the Information Technology and Innovation Foundation. Mr. Stepp previously served at the Breakthrough Institute, a think tank focusing on political thinking in the 21st century. In 2009 Mr. Stepp was a Fellow at the National Academies of Science where he worked on the Transportation Research Board. He earned his master's from Rochester Institute of Technology.

Our second witness is Mr. Jack Spencer, Research Fellow at the Heritage Foundation's Roe Institute for Economic Policy Studies. Previously, he served at the Babcock & Wilcox companies where he worked on commercial, civilian, and military nuclear energy issues. Prior to this, he worked at the Heritage Foundation as an analyst for defense and national security. Mr. Spencer earned his master's from the University of Limerick in Ireland.

Our third witness is Dr. Thom Mason, Director of Oak Ridge National Laboratory. Dr. Mason joined Oak Ridge in 1998 as Science Director of the Spallation Neutron Source Project and was named Associate Lab Director in 2001. Before Oak Ridge, Dr. Mason was a member of the physics faculty at the University of Toronto. He earned his doctorate in condensed matter sciences at McMaster University.

Our final witness is Dr. Dan Arvizu, Director at the National Renewable Energy Laboratory. Dr. Arvizu was appointed Director in 2005 and was reappointed another six-year term in 2011. Prior to that, Dr. Arvizu was an executive with Sandia National Labs and began his career at AT&T Bell Telephone Labs. He earned his Ph.D. in mechanical engineering from Stanford.

Welcome, one and all.

As our witnesses should know, spoken testimony is limited to five minutes each, after which the members of the committee will have five minutes each to ask questions.

Before recognizing our first witness, I would like to take a moment to explain how our first two witnesses will proceed. The report these witnesses are testifying about was a joint effort between the Heritage Foundation and the Information Technology and Innovation Foundation, which is fabulous because they tend to be on opposite sides of the political spectrum. They have submitted joint

testimony for today but will each be given five minutes for oral testimony. So we are just thrilled that you are working together.

And I now recognize Mr. Stepp for five minutes to present his testimony.

TESTIMONY OF MR. MATTHEW STEPP,
SENIOR POLICY ANALYST,
INFORMATION TECHNOLOGY AND INNOVATION FOUNDATION

Mr. STEPP. Thank you. Chairman Lummis, Ranking Member Swalwell, and the Committee, I want to thank you and appreciate the opportunity to appear for you—in front of you today. I think this is a particularly important topic because Congress has an enormous opportunity to turn the national labs into engines of innovation and economic growth with minimal budget impact.

My name is Matthew Stepp. I am the Senior Policy Analyst at ITIF where I direct its Energy Innovation Program. And from my point of view, the national labs are one of the single most important public institutions in the Nation's innovation enterprise and they can serve as a central tool for boosting job growth, creating regional economic development, and supporting America's national research goals. So I think just like Federal investments in research and development writ large, the national labs are fundamentally important to America and America's future.

But, however, the lab system as it is currently managed and organized is falling short of its innovation potential and ultimately this is why ITIF spearheaded the nonpartisan effort along with colleagues from the Heritage Foundation and the Center for American Progress to try to find some common ground for reform.

And there are really three principal causes that we focus. First is that there is bureaucratic micromanagement at the labs that muddles and slows the research process; two, the lab research is funded by small technology-centered grants rather than funding long-term research outcomes such as those developed at the DOE's innovation hubs and ARPA–E; and three, the labs' relationship with industry is often weak restricting the appreciable economic outcome of the research and limiting potential industry partnerships, particularly with small businesses.

And so although my written testimony takes a deeper look at over a dozen policies, I just want to highlight three I think that are maybe the most important. First, Congress should devolve the management of the labs from centralized DOE control to a more pure version of the GOCO model where contractor accountability is the chief method of oversight. So Congress could do this by creating a task force consisting of the labs, DOE, industry, and academic stakeholders to target duplicative regulations that DOE must eliminate or change.

So, for example, one area of reform is the size of and the extent of the DOE's site offices and the extent that those site offices are involved in the day-to-day decision-making labs, which is currently dictated from Washington.

Second, Congress should provide the labs better incentives and more flexibility to partner with industry to spur technology transfer. And so the current system of agreements is complex and oftentimes onerous to navigate, so one way Congress can do this is

amend the Stevenson-Wydler Innovation Technology Act of 1980 to allow the labs to conduct collaborative, non-national security-related research with third parties without DOE sign off. And obviously, this could be implemented on a pilot basis at first and it would still require annual review and oversight. But I think it would greatly accelerate the process of creating industry lab partnerships and accelerate the process in moving research from the lab market.

And third, I think Congress should begin implementing the important process of reforming the Department of Energy, as Ranking Member Swalwell indicated, and I think the key point here is that they should do so around encouraging innovation rather than the stovepipe basic versus applied research programs or the technology programs that we see today. And there is many steps to this.

I think the first and most important, as was stated, is combining the Office of Science and the Office of the Under Secretary of Energy into one streamlined Office of Science and Technology. This would take—effectively put all non-NNSA labs, the 13 of the 17 national labs, under one single leadership, which I believe would create better research coordination, more productive funding, as well as opportunities for long-term planning.

So in conclusion, I think what is important to state here is that as the United States faces new and intense competition for global innovation leadership, the labs can certainly serve as national—as a national competitive advantage. And it fact, they fundamentally must do so if we want to continue to lead the world in innovation, but it can only do so if it is reformed into a more nimble research system which doing so requires starting at the top with changes that don't just tinker around the edges and reform the system as a whole.

Thank you, and I look forward to your questions.

[The prepared statement of Mr. Stepp follows:]

Matthew Stepp
Senior Policy Analyst
Information Technology and Innovation Foundation (ITIF)

Hearing on
"Oversight and Management of Department of Energy National Laboratories and Science Activities"

Before the House Science, Space and Technology Committee
Subcommittee on Energy
U.S. House of Representatives

July 11, 2013

Chairman Lummis, Ranking Member Swalwell and members of the Committee, I appreciate the opportunity to appear before you today. Congress has an enormous opportunity to turn the National Labs into engines of innovation and growth, with minimal budget impact.

My name is Matthew Stepp. I am a Senior Policy Analyst at the Information Technology and Innovation Foundation (ITIF), where I direct its energy innovation program. From ITIF's point of view, the National Labs are one of the single most important public institutions in the United States innovation enterprise, and can serve as a central tool for boosting job growth, increasing regional economic development, and supporting America's national research goals.

Without a doubt, the labs have produced breakthrough science and technology – everything from leading edge computing, carbon fiber, nano-based building materials, and energy dense batteries, to name a few, have come from lab research. Just like federal investments in research and development writ large, the labs are fundamentally important to America.

However, the Lab system as it is currently organized is falling short of its innovation potential. The principal causes are threefold:

1) Bureaucratic micromanagement muddles the research process by creating an innumerable list of decision-making points from DOE;

2) Incremental funding from Congress slices research funding into small grants by technology, rather than funding long-term research outcomes such as those developed through DOE's Innovation Hubs or ARPA-E;

And 3) the Labs' relationship with industry is often weak, restricting the appreciable economic impact of research and limiting potential industry partners, particularly small businesses.

I'll highlight three broad categories of reform as particularly important:

First, Congress should devolve management of the Labs from centralized DOE control to a purer version of the GOCO model where contractor accountability is the chief method of oversight. Congress should order the creation of a taskforce consisting of lab, DOE, industry, and academic stakeholders to target duplicative regulations that DOE must eliminate or change. One area of potential reform is the extent that site offices are involved in day-to-day lab decision-making. The labs should be able to negotiate with DOE over how extensive site office oversight needs to be, rather than receiving dictation from Washington.

Second, Congress should provide the labs better incentives and more flexibility to partner with industry to spur technology transfer. The current system of agreements is complex and onerous. Congress should amend the Stevenson-Wydler Technology Innovation Act of 1980 to allow the labs to conduct collaborative, non-national security research with third parties without DOE signoff. This more flexible system could be implemented on a pilot basis at first and would still require annual review by DOE, but will greatly accelerate the process of creating industry-lab partnerships.

Third, Congress should begin the important process of reforming the Department of Energy around encouraging innovation, rather than stovepiped basic and applied research programs. The first step would be for Congress to combine the Office of Science with the Office of the Under Secretary for Energy into one streamlined Office of Science and Technology. This would effectively put all non-NNSA Labs under single leadership and offer the ability for better research coordination, more productive funding for lab research and more opportunities for long-term planning.

As the United States faces new and intense competition for global innovation leadership, the Labs system can certainly serve as a national competitive advantage, but only if it is reformed into a more nimble research organization. Doing so requires starting at the top with changes that don't just tinker around the edges but reform the system as a whole.

Matthew Stepp is a Senior Policy Analyst with the Information Technology and Innovation Foundation (ITIF) specializing in climate change and energy policy. His research interests include energy technology development, the role of institutions in innovation, the intersection of climate science and policymaking, transportation policy, and the role of innovation in reducing global greenhouse gas emissions.

Before joining ITIF, he served as Fellow at the Breakthrough Institute, a think tank located in Oakland, California, focused on modernizing political thinking in the 21st century. He worked on developing new U.S. climate policies centrally focused on technology and innovation as an alternative to politically-contentious and structurally-flawed carbon caps and pricing schemes.

Prior to this position, Matthew graduated from the Rochester Institute of Technology with a M.Sc. degree in Science, Technology, and Public Policy. His thesis modeled the impact of transportation carbon reduction policies to highlight opportunities for greater emission reductions due to system synergies. This work has been published in the *Journal of Energy Policy* and presented at both regional and stakeholder conferences.

In 2009, Matthew was a Christine Mirzayan Science and Technology Fellow at the National Academies of Science where he worked with the Transportation Research Board to analyze light duty vehicle energy reduction policy strategies. He also has a B.Sc. in Meteorology from Millersville University where he conducted a wide range of research on the meteorological applications of synthetic radar and conducted climate modeling studies at the NASA Goddard Space Flight Center.

Matthew has appeared in various news and media outlets including the *Washington Post*, *MIT Technology Review*, *Platts Energy Week*, *The Globalist, Ars Technica, E&E, National Journal, Forbes* and *Politico*. He is also a regular columnist at *Energy Trends Insider* and *The Energy Collective.*

Chairman LUMMIS. Thank you, Mr. Stepp, for those really specific recommendations.

Mr. Spencer, you will have five minutes.

TESTIMONY OF MR. JACK SPENCER,
SENIOR RESEARCH FELLOW,
THE HERITAGE FOUNDATION

Mr. SPENCER. Thank you, Mrs. Chairman, Ranking Member Swalwell, and Members of the Committee.

The submitted remarks, the report, as you know, is a document where we all agree. What I am going to do is move away from that just slightly not into areas that we don't agree on but rather focus my comments into how these recommendations in this report fits into more of a conservative free-market vision and why this fits into Heritage's vision of how Federal research should move forward.

My name is Jack Spencer and I am a Research Fellow at the Heritage Foundation. The views I express in this testimony are my own and should not be construed as representing any official position of the Heritage Foundation.

The work that ultimately became the Reimagining Report began some three years ago. At Heritage we were becoming concerned that America's government research enterprise was getting off track. We felt that it was quickly becoming a mechanism to subsidize the private sector, to advanced fleeting political agendas, or even sometimes used to pay back special interests. So some colleagues and I decided to take a detailed look at the Department of Energy spending. We quickly began identifying significant problems throughout the budget.

The problems roughly fell into four categories: too much focus on commercialization, too much programmatic duplication, too much political influence, and too many subsidies. Simply creating a list of programmatic reductions, however, was not enough. What we found we needed was real reform, and the Reimagining Report puts forth that reform.

Though reimagining is decidedly nonpartisan and unapologetically appeals to stakeholders across the ideological spectrum, in developing the court, my objective was to ensure that its recommendations were consistent with a conservative free-market vision. Ultimately, we determined that many of the problems facing the Nation's research establishment emanated from an overbearing, Washington-generated bureaucracy that was driven more by politics and a desire to control than by science, markets, or good governance rate. Thus, we focused on recommendations that broadly decentralized authority, realigned incentives to be consistent with more desired outcomes, and that harnessed the power of markets.

To achieve this, first, we reorganized the Department of Energy research bureaucracy into a single unified Office of Science and Technology. This is critical from a conservative limited market perspective. Roughly speaking, the bureaucracy currently consists of separate entities that conduct basic research and those that conduct applied research. The applied research generally includes activities that are further along the technology development spec-

trum and are theoretically closer to commercialization. This is the type of research that the private sector should shoulder from our estimation. By removing the bureaucracy created specifically to support those activities, we begin to diminish the institutional bias towards it. Now, this does not eliminate applied research from the Department of Energy. Indeed, those of us who oppose it must continue to fight that fight on program-by-program basis.

Secondly, we drastically reduced Washington micromanagement of the labs. Currently, lab managers must follow arcane bureaucratic rules that drive up costs, increase bureaucracy, and perpetuate general inefficiency. We recommend a performance-based contracting system where the contractors are free to meet their contractual obligations largely as they see fit rather than by prescriptive oversight by the DOE.

And finally, we free lab management contractors to engage with the private sector, universities, or other agencies based on market demand and allow them to keep a portion of the revenues as part of their management fee.

The Federal Government today largely pushes research into the market. Our approach creates a market incentive for—to transfer technology out of the labs. For conservatives, it promotes near-term spending cuts by removing the temptation for government to use taxpayer funds to fund research facilities used by non-federal government entities. We create a system where such users pay directly for those services. This eliminates any justification for taxpayers to fund it. It also sets the stage potentially for shrinking the size of government. Ultimately, if a facility attracts no funding, then it should be eliminated. If it attracts adequate third-party funding, that maybe it should be privatized.

By implementing these reforms, we believe that we can achieve five distinct outcomes. We can rationalize the lab—rationalize the size of the lab infrastructure; we can better focus taxpayer resources on those things that really advance the national mission; we can efficiently move—more efficiently, I should say, move commercially attractive technology into the marketplace; we can yield less government waste and more efficient operations; and finally, we can allow technology to be pulled by markets, not pushed by government.

In conclusion, the Nation can benefit from federally funded research. We see it every day in the realm of national security to give an example. The government gets off track, however, when it attempts to directly intervene in the commercial sector. Like it or not, the Federal Government is a horrible venture capitalist. This is not to suggest, however, that the government—that government-funded research cannot lead to commercial success. Who doesn't use the internet or GPS? And the model for translating government spending into commercial success is not to build a program for the purpose of commercialization. After all, GPS was not the result of a government program to yield some commercial product but rather was developed to meet a national security need.

The key is to develop a system that ensures the taxpayer research dollars are focused on meeting the Nation's research needs first, then encourage interactions with third parties should this re-

search activities yield something that has commercial application. Our recommendations do precisely that.

Thank you for your time today. I look forward to answering any questions you may have.

[The prepared statement of Mr. Spencer follows:]

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CONGRESSIONAL TESTIMONY

Oversight and Management of Department of Energy National Laboratories and Science Activities

Oral Testimony before
Committee on Science, Space and Technology Subcommittee on Energy
United States House of Representatives

9:30 am
July 11, 2013
Rayburn House Office Building
Room 2318

Jack Spencer
Senior Research Fellow
The Heritage Foundation

My name is Jack Spencer. I am a Senior Research Fellow at The Heritage Foundation. The views I express in this testimony are my own, and should not be construed as representing any official position of The Heritage Foundation.

I would like to take a moment to thank Chairman Lummis, Ranking Member Swalwell, and Members of the Subcommittee for the opportunity to speak with you today about this very important issue.

The work that ultimately became the *Reimagining* report began some three years ago. At Heritage, we were becoming concerned that America's government research enterprise was getting off track. We felt that it was quickly becoming a mechanism to subsidize private sector research, to advance fleeting political agendas or even used to payback special interests.

Some colleagues and I decided to really dissect the Department of Energy (DOE) budget. As we looked, we began identifying significant duplication and inefficiency within the budget. Beyond that, we found a lot of spending on programs that were simply unnecessary.

These problem areas fell roughly into four categories:

Commercialization. These are programs whose purpose is to bring a new technology into the marketplace. This failed model essentially consists of a technology gaining political support. That support is then translated into a program whose purpose is to bring that technology into the market. These technologies are generally subsidized in other ways as well. For example, if people won't buy them, the government mandates them. Or if they cost too much, the government hides the costs with some tax preference, grant or loan guarantee. As a result, these technologies begin to incorporate and depend on subsidies in their business models, meaning that they never seem to quite be ready to stand on their own. Government research can lead to commercial products. GPS is a good example. The difference is that technologies like the GPS were developed to meet a government need and then were commercialized by the private sector;

Duplication. This is more straight forward and fairly self-evident. But essentially, these are programs whose purposes or objectives are approximated in multiple places across government;

Politicization. Some programs do little more than advance political agendas. The agenda could be green jobs, energy independence, climate change or any number of other policy interests that we have seen ebb and flow over the years. The problem here is not the objective per se but rather the government's ability to manage markets to achieve it. These agendas are more often than not merely slogans attached to spending programs to justify their existence. They almost never leave the nation better off and often do just the opposite; and

Subsidization. Whether to improve manufacturing processes, extend plant lives or conduct specific research to solve commercial problems, a large amount of Department of Energy spending is quite simply finances activities that the private sector should shoulder. Indeed, from my perspective, there is almost no reason to use taxpayer money to offset the costs of private research requirements.

Simply creating a list of programmatic reductions, however, was not enough. While reductions are important, the DOE really needs reform.

Though the *Reimagining* report is decidedly nonpartisan and unapologetically appeals to stakeholders across the ideological spectrum, in developing the report my objective was to ensure that its recommendations were consistent with a conservative, free-market vision.

Doing so required that the recommendations:

Decentralize power. Micromanagement does not work. As a conservative, I believe that those on the ground, close to the problem, if given clear direction are best positioned to successfully carry out a mission. Of course, there is risk involved with this approach. But there is also great reward. The key is to minimize the risk. One way to do this is to properly align incentives.

Properly align incentives. If greater freedom is afforded to manage a public asset, then managers must be held to greater levels of liability and responsibility. Simply increasing responsibility, however, is not adequate. The increased responsibility must be coupled with increased reward opportunity. This requires that the reforms be market based.

Recognize the power of markets. Harnessing the strength of the market must be central to any reform effort. Too often government policies fight the market. These policies try to push products or technologies that have little appeal to consumers, disrupt the technological development process through subsidies or create some other market distortion that ultimately must be undone. Though it'sa lesson that the government seems never to learn, the fact is that not even the U.S. government can beat the market in a fight.

Taken together, our recommendations fix each of the problems that I laid out earlier while maintaining a coherent conservative vision.

I'd now like to take a few minutes to discuss some of the recommendations that I believe are most salient.

First, we reorganize the Department of Energy research bureaucracy into a single, unified Office of Science and Technology. This is critical from a conservative, limited government perspective. Roughly speaking, the bureaucracy currently consists of separate entities that conduct basic research and those that conduct applied research. The applied research generally includes activities that are further along the technology development spectrum and are theoretically closer to commercialization. This is the type of research that the private sector should shoulder. By removing the bureaucracy created specifically to support those activities, we begin to diminish the institutional bias towards it. This does not eliminate applied research from the Department of Energy necessarily. Those of us who oppose it will continue to fight that fight on a program-by-program basis.

Secondly, we drastically reduce Washington micromanagement of the labs. Currently, lab managers must follow arcane bureaucratic rules that drive up costs, increase bureaucracy, and perpetuate general inefficiency. We recommend a performance-based contracting system where the contractors are free to meet their contractual obligations largely as they see fit, rather than by prescriptive oversight from DOE.

And finally, we free lab management contractors to engage with the private sector, universities or other agencies based on market demand and allow them to keep a portion of the revenues as part of their management fee. The federal government today largely pushes research into the market. Our approach creates a market incentive to transfer technology out of the labs. For conservatives, it promotes near-term spending cuts by removing the need for taxpayers to fund research facilities needed by third parties. Our approach allows third party users to pay directly for those services thus eliminating the "need" for taxpayers to fund it. Setting the stage for either privatization or elimination provides long-term benefits as well. If a facility attracts no funding, then it should be eliminated, if it attracts adequate third-party funding, then it can be privatized.

By implementing these reforms, we believe that we can achieve five distinct outcomes.

1. **Rationalize lab size.** Taxpayer funding should focus on activities that meet specific government needs. Presumably this will leave substantial infrastructure as excess. Our reforms will rationalize that infrastructure by identifying what is needed and what can be eliminated or privatized.

2. **Focus taxpayer resources.** Instead of trying to maximize taxpayer funding to sustain potentially outdated or excessive lab infrastructure, Congress can focus funds simply on those activities that advance specific national requirements as lab managers will be free to generate support for excess capacity through third party cooperation.

3. **Efficiently move commercially attractive technology into the market.** By removing barriers to cooperation and creating incentives, we should expect more GPS-like success stories.

4. **Yield less government waste and more efficient operations.** Duplicative regulations and an overbearing bureaucracy is costly and quashes the entrepreneurial spirit so critical to any well run organization.

5. **Allow technology to be pulled by markets, not pushed by government.** By focusing the DOE on core government missions and relying on lab managers to develop cooperative efforts with the private sector, our recommendations will rely more on market forces to drive technology transfer rather than political ones.

In conclusion, the nation can benefit from federally-funded research. We see it every day in the realm of national security to give an example. The government gets off track, however, when it attempts to directly intervene in the commercial sector. Like it or not, the federal government is a horrible venture capitalist.

This is not to suggest, however, that government-funded research cannot lead to commercial success. Who doesn't use the internet or a GPS daily?

But it is to suggest that the model for translating government spending into commercial success is not to build a program for the sole purpose of commercialization. The key is to develop a system that ensures that taxpayer research dollars are focused on meeting the nation's research needs, first. Then, encourage interactions with the private sector based on market demand.

Our recommendations do precisely that.

Thank you for your time today. I look forward to answering any questions you may have.

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Jack Spencer Bio

Jack Spencer is the Senior Research Fellow in Nuclear Energy at The Heritage Foundation's Roe Institute for Economic Policy Studies.

In this position, Spencer works on domestic and international nuclear energy and related issues. His areas of concentration include nuclear waste management, nuclear energy technology, subsidy policy, and international approaches to nuclear energy. He also studies nuclear regulation, nuclear energy and proliferation, global market issues, and national security uses of nuclear power.

Spencer began his second tour of duty at Heritage in September 2007. Previously, he was at The Babcock & Wilcox Companies where he worked on commercial, civilian, and military nuclear energy issues.

From 1998 to 2005, Spencer was a Heritage analyst for defense and national security.

Spencer earned his bachelor's degree in international politics from Frostburg State University and his master's degree from the University of Limerick in Ireland. While in Limerick , he also began research towards his doctorate.

[The joint statement of Mr. Stepp and Mr. Spencer follows:]

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CONGRESSIONAL TESTIMONY

Oversight and Management of Department of Energy National Laboratories and Science Activities

Testimony before
Committee on Science, Space and Technology Subcommittee on Energy
United States House of Representatives

9:30 am
July 11, 2013
Rayburn House Office Building
Room 2318

Matthew Stepp
Senior Policy Analyst
The Information Technology & Innovation Foundation

Jack Spencer
Senior Research Fellow
The Heritage Foundation

Chairman Lummis, Ranking Member Swalwell, and Members of the Subcommittee:

Thank you for inviting ITIF and The Heritage Foundation to speak to the Committee this morning about maximizing the potential of our national labs. The views expressed in this testimony of those of the authors, and should not be construed as representing any official positions of The Information Technology & Innovation Foundation or The Heritage Foundation.

We provide alongside this written testimony our joint study, written with a colleague from the Center for American Progress, entitled, *Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy.* The study coauthors represent a diverse set of three organizations from across the ideological spectrum with different perspectives. We may not agree on funding levels, funding priorities, or the specific role of government in technological innovation, and nothing in our joint report or this written testimony should be construed as support for or opposition to those ideas. Instead, the purpose of our efforts was to put forth a set of recommendations that will bring greater efficiency to the DOE lab system, produce more relevant research, and increasingly allow the private sector to pull value out of that research. These recommendations are as relevant to a large, highly funded research agenda as they are to a much more limited one.

Summary

That said, after more than a year of research and engagement with the labs, DOE, industry, and academia, as well as countless hours of discussion, we do agree that:

- Federally funded research results in scientific discovery that can play a positive role in America's economic future,
- Federally funded research at the labs should not replace or crowd out private-sector and university-based research,
- Research should be driven by science and national needs, and not by special interest politics,
- Washington should oversee the labs, and not micromanage them,
- Barriers preventing the movement of research from the lab to the market should be minimized,
- Taxpayer resources should be used as efficiently and effectively as possible,
- Market forces can help bring efficiency and rationality to the lab system, and
- The current system needs substantial reform

Both ITIF and Heritage believe that even in a time of policy gridlock in Washington, these nonpartisan reforms simply make sense. The labs have been largely running on autopilot for too long. A jolt to the system is needed now more than ever. It is our goal to spur debate on lab reform but, more importantly, to facilitate and support tangible and constructive changes from Congress, the White House, the Department of Energy, and the labs themselves. In summary, we call on Congress to:

1. Congress should allow labs to use flexible pricing – i.e. charge above full cost recovery - for proprietary use of user facilities and special capabilities.

2. Congress should facilitate merging the existing Offices of Science, Energy Efficiency and Renewable Energy, Fossil Energy, and Nuclear into a new Office of Science and Technology.

3. Congress should direct the Secretary of Energy to facilitate a stakeholder discussion to inform how the new coordinated program offices under the new Office of Science and Technology should be structured.

4. Congress should instruct DOE to remove prescriptive overhead accounting rules and instead provide broad categories of funding that the labs can spend as necessary.

5. Congress should remove the 8 percent cap on Lab-Directed Research and Development (LDRD) funds.

6. Congress should provide a less vague description of technology transfer that allows labs to spend overhead funds on early-stage demonstrations that either remove technology barriers limiting private-sector interest or repurpose original research for new problems.

7. In absence of DOE action, Congress should expand ACT agreements beyond a pilot program as well as remove restrictions that prevent labs from partnering with entities that receive federal funding.

8. In absence of Administration action, Congress should create a high-level task force with representatives from all key stakeholders in the lab system, to address two issues, which must be actionable by DOE:

    - How to devolve greater authority from centralized DOE control to the labs themselves.
    - To develop better technology-transfer metrics to be implemented in an expanded PEMP process that explicitly includes technology-to-market evaluation as a key metric for M&O contractor success.

9. In absence of DOE action, Congress should spur DOE to develop a more aggressive contractor accountability system that follows the recommendations made by the aforementioned task force.

10. In absence of DOE action, Congress should allow the labs autonomy in forging third party partnership agreements without DOE pre-approval, first on a pilot program basis.

11. Congress should require DOE to prominently include technology transfer in the expanded PEMP process, with a significant evaluation weight the merits its importance to the labs meeting their mission.

Why the National Labs Matter to America

The Department of Energy (DOE) National Laboratory system represents 17 facilities and more than $18 billion in public research in fiscal year 2011.[1] Originally created in the late 1940s by the Atomic Energy Commission—the precursor to the modern DOE—to manage the United States' nuclear-weapons research and development, or R&D, the labs are distinctive in three ways.

Hubs of Mission-Driven Research in the Public Interest.

Public support for science and technology research can play a significant role in helping society seize opportunities to advance national, social, economic, and environmental well-being. The labs are tasked with conducting research in support of the public good that universities or private companies are unwilling or incapable of doing. This includes: (1) addressing unique national imperatives such as research for national defense; (2) capturing positive externalities from technology innovation that are not easily appropriated by any one firm and for which private incentives for investment are not commensurate with the potential for public good; (3) conducting scientific research with very long time horizons for which an immediate commercial application is unclear, but has significant potential; and (4) solving unexpected national and international challenges that require rapid or unique research-based solutions.

Centers of Multidisciplinary Research

Today, rather than singularly focused research facilities, the labs respond to the needs of modern-day science by serving as platforms where multidisciplinary work can be coordinated on a large scale to tackle national goals. For these reasons, the labs should not be thought of specifically as energy, science, or weapons facilities, despite the fact that the system is housed within DOE. These multidisciplinary national institutions support the scientific and technology missions of government and society writ large.

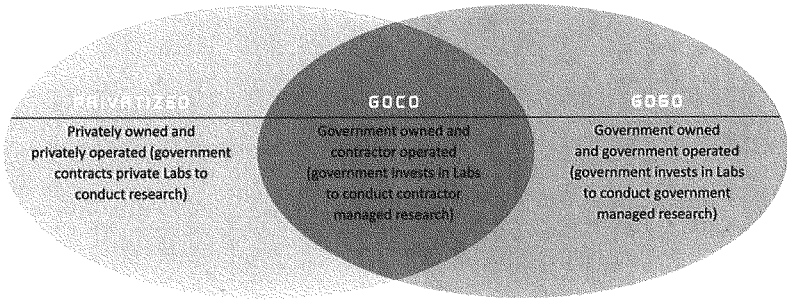
Few of the labs are restricted to fulfilling their original research purposes. Energy labs also conduct fundamental research in material science, while science labs shepherd sophisticated applied-research programs in everything from energy efficiency to cyber security to genetics. And weapons labs conduct research in both science and applied research. Sandia National Laboratories, for example, which stewards the blueprints for more than 6,300 of the 6,500 components of U.S. nuclear weapons, also has robust, interdisciplinary research programs and user facilities, such as the National Solar Thermal Test Facility, where the broader academic and industrial research communities are invited to collaborate on issues unrelated to nuclear weapons.[2]

Government Owned, Contractor Operated

Sixteen of the 17 National Labs operate as government owned, contractor operated, or GOCO, federally funded research and development centers, or FFRDC.[3] The Atomic Energy Commission carefully chose the GOCO model as an alternative to creating either

an entirely government-controlled lab system or an entirely private-sector-based system.[4] The GOCO model was meant to provide the best of both worlds: flexible access to highly specialized technical talent and business-tested management practices, as well as the ability to direct complex, risky research unique to national needs. (see Figure 1)

FIGURE 1: Spectrum of lab ownership and management models.



Bridges to the Marketplace

The labs facilitate moving research into the market largely through research collaborations with universities and industry, as well as by licensing patented innovations to the private sector. In 2010 the DOE labs earned more than $40 million in licensing revenue from roughly 3,500 active technology licenses and participated in nearly 700 cooperative research and development agreements, or CRADAs, with non-DOE entities.[5] And in 2011, $500 million in research was subcontracted by the labs to universities in instances where academic researchers needed specialized facilities and equipment or larger multidisciplinary teams were needed to solve complex problems.[6]

Another key place for collaboration is through the labs' user facilities, which are facilities with state-of-the-art advanced equipment, skilled staff, and technical capabilities that are made available to the greater government and public research community.[7] The Princeton Plasma Physics Laboratory, for example, is one of only a handful of facilities in the world with a working fusion reactor that scientists can use to advance the understanding of fusion energy.[8] The Los Alamos National Laboratory hosts scientists from around the world to use its ion-beam materials, electron microscopy, proton radiography, and high-energy laser-physics facilities.[9] In 2011, 350 American firms, including 47 Fortune 500 companies, took advantage of lab user facilities to conduct research supporting the creation of new products in industries as diverse as pharmaceuticals, advanced materials for semiconductors and vehicular batteries, telecommunications, and consumer goods.[10]

The Need for Reform

Without a doubt, the labs have created market-changing, nationally important science and technology since their founding. Technology developed in the labs has seeded new American industries and products as diverse as CDs and DVDs, satellite communications, advanced batteries, supercomputing, resilient passenger jets, and cancer therapeutics, all at a cost of about 0.03 percent of gross domestic product, or GDP, annually.[11] The question we pose, therefore, is not whether the United States is getting *any value* from spending public dollars in the labs; rather, it is whether the United States can get *more value* from spending public dollars in the labs than it currently is. Our answer is yes.

The labs were born out of the single-minded focus on building the atomic bomb. Since the end of the Cold War, however, the nation has struggled to develop a new mission for the labs that effectively harnesses their unique capabilities as part of a comprehensive or rational public scientific enterprise. While the labs have served the public well in the past, the status quo is ill adapted for the needs of the 21st century innovation economy.

The sad truth is the labs institutional and management structure is outdated, inflexible, and weakly connected to the marketplace, inhibiting U.S. innovation when we need it most. We found three issue areas ripe for reform.

Issue 1: Troubled Relationship Between DOE and the Labs

The most pervasive issue with the labs is the slow transformation from their unique stewardship and management model toward a more restrictive system that concentrates decision making in Washington. The GOCO model that provides operational flexibility for managers to creatively pursue national missions has gradually weakened over time. DOE has instead created layers of central control that have shifted lab management to more closely resemble a fully federalized system than ever before. As a result, flexibility is constrained, accountability is no longer the principal method of oversight, and the innovation process is muddled.

In many instances, DOE has replaced contractor accountability with direct regulation of lab decisions—including hiring, worker compensation, facility safety, travel, and project management—in an effort to avert future congressional scrutiny such as hearings and budget cuts. While the merits of reducing government waste are laudable, the reality is that DOE has gradually replaced contractor accountability with an increasingly rigid form of micromanagement, which has created inefficiencies with little to show for it.

In practice, this means DOE has added duplicative layers of safety, security, human-relations and environmental regulations in addition to those already mandated by federal and state law. Rules from DOE, the Office of Management and Budget, or OMB, and the Occupational Safety and Health Administration, or OSHA, overlap and often require lab managers to repeatedly jump through similar hoops.

The DOE Inspector General's Office has estimated the cost of complying with these multiple layers of bureaucratic requirements to be well into the millions for an individual

lab. A study produced by Perspectives, Inc., found that DOE site offices added 16 days to the processing time of collaborative R&D agreements with industry partners on average.[12] Additionally, the study found that this figure did not include the time spent by the contractor to "prepare" the agreement packages in order to maximize likelihood of site-office approval, and that "much time is spent by the laboratories in addressing Site Office requirements and concerns that is not captured in the cycle time estimates."[13] The reason site-office interference is so burdensome is because DOE, according to respondents in the study, "manage[s] the agreement process with *inflexibility* in mind." [emphasis in original][14]

The DOE (as well as Congress and the OMB) micromanages lab expenditures as well. Lab budgets are divided into individual accounts with restrictions on how each tranche of funding can be used. These restrictions make it difficult for lab managers to make strategic decisions because they must manage many separate accounts that cannot be mixed.

While the majority of money goes into congressionally mandated research operations, a small percentage of research budgets—defined as "overhead"—goes into other accounts to cover management costs, facility upkeep, and other lab-directed science and technology spending. Tight restrictions on these overhead accounts limit contractor flexibility and make it difficult for managers to strategically invest in advancing promising research or strengthening lab infrastructure or capabilities.

In the private sector, businesses have the flexibility to react to changing circumstances and new developments by reallocating funds as necessary among various activities, products, and programs. Congress provides the labs similar opportunity by allowing for laboratory-directed research and development, or LDRD—an overhead account that lab managers can pull from to invest across research projects within very strict regulations.[15]

Studies conducted by DOE and the Government Accountability Office have found that projects funded by LDRD, despite its small budget, are often the most productive.[16] LDRD-funded projects, according to one lab, are the "most important single resource for fostering excellent science and technology for today's needs and tomorrow's challenges," and have been "extremely successful in supporting research at the forefront of science, providing new concepts for core missions, and creating an exciting research environment that attracts outstanding young talent."[17] Under today's rules, however, the labs are not allowed to actively manage their own budgets, resources, and priorities to more efficiently meet research objectives, despite the potential merits of this system.

Issue 2: Stovepiped Finances and Stovepiped Vision

The labs are beholden to Congress for continued support, but this support is delivered through a complex system of separate but interconnected funding "stovepipes." Money is categorized or recategorized repeatedly as it moves from a congressional appropriation to DOE's budget, through six stewardship offices, and finally through dozens of programs and thousands of specific contracts to end up in the hands of lab managers and

researchers. This long and complicated resource-allocation process offers a number of opportunities to leverage efficiency gains.

Over the past several decades, Congress and DOE have increasingly micromanaged lab finances from a distance. Budget atomization is largely due to overly prescriptive DOE and congressional oversight that emphasizes "how" research is being conducted rather than "what" the end goal of the research is. Because each institutional and research category is tasked with funding its own portfolio of technologies, the labs become locked into prearranged research pathways that may not be the cheapest, most direct, or most effective way to solve problems. Program managers focus on short-term research objectives tied to their appropriated grants at the expense of pursuing more promising but longer-term avenues of research.

This results in two immediate impacts: (1) the labs are not well equipped to engage in long-term planning to strategically support promising areas of research unless they lie within existing atomized technology categories, and (2) the labs must spend increasingly more time and overhead bidding on and managing small contracts and grants, which takes resources away from supporting promising research.

Not only is research funding inefficiently allocated, it is also disconnected from lab stewardship. There are six different offices responsible for stewarding the 17 labs. From a bureaucratic point of view, allocating stewardship in this way may make sense—labs are closely associated with the office tasked with conducting research most closely tied to the mission and core competencies of lab researchers and infrastructure. The National Renewable Energy Laboratory, or NREL, for example, conducts translational renewable-energy research; therefore, it is stewarded by EERE.

Lab portfolios, however, have evolved over time due to changing national needs and infrastructure, which has resulted in a growing divide between labs, their associated offices, and their primary funding sources. This disconnect produces the perverse effect of splitting up DOE offices charged with overseeing the labs from the government agencies, programs, and offices that provide a significant portion of the funding. In many cases, the offices providing the bulk of research funding are not the offices providing oversight, potentially leading to uncoordinated and inefficient results (see Figure 2). In fact, five of the labs receive 55 percent or less of their funding from the stewarding office. The result is that lab "minority shareholders" are providing the majority of stewardship, potentially decreasing the lab managers' flexibility to interact with other funding sources and do long-term planning for non-stewarding agencies.

The growing gaps between lab stewardship and funding have reinforced a lack of lab-wide strategic planning. Because each lab receives funding—often more than half of its research budget—from offices and agencies other than its stewarding office, lack of strategic planning potentially leads to redundancy and missed opportunities to leverage the full research base toward solving problems. According to the National Academy of Public Administration, "[T]here is no comprehensive mechanism to integrate DOE's

planning processes to ensure that the Department is optimizing the labs capabilities to meet the most critical needs of the Nation."[18]

FIGURE 2: Funding sources for research conducted in DOE labs.[19]

LAB STEWARD	FUNDING FROM STEWARD (%)	FUNDING FROM OTHER DOE OFFICES (%)	FUNDING FROM NON-DOE OFFICES (%)	TOTAL FY 2011 COST (MILLIONS)
Ames (SC)	70.5%	15.3%	14.2%	$34
Argonne (SC)	55.3%	29.3%	15.4%	$763
Berkeley (SC)	70.1%	14.5%	15.4%	$824
Brookhaven (SC)	83.7%	9.9%	6.4%	$750
Fermi (SC)	99.6%	0.0%	0.4%	$437
Idaho (NE)	55.2%	22.0%	22.8%	$1,063
Lawrence Livermore (NNSA)	74.7%	6.9%	18.3%	$1,584
NETL (FE)	42.3%	53.9%	1.8%	$1,400
Los Alamos (NNSA)	70.7%	18.5%	10.7%	$2,551
NREL (EERE)	89.4%	6.1%	4.5%	$521
Oak Ridge (SC)	48.5%	34.6%	16.9%	$1,542
Pacific Northwest (SC)	20.8%	52.0%	27.3%	$945
Princeton (SC)	98.1%	0.0%	1.9%	$87
Sandia (NNSA)	55.1%	9.5%	35.4%	$2,438
Savannah River (EM)	55.1%	43.7%	1.3%	$2,540
SLAC (SC)	97.1%	0.8%	2.0%	$375
Thomas Jefferson (SC)	93.8%	0.3%	5.9%	$214
Average / Total	**69.4% (average)**	**18.6%**	**11.8%**	**$18,068 (Total)**

Finally, the separation of labs into so-called basic and applied program offices further complicates the funding and management issue. The reality is that most of the large basic labs within the Office of Science conduct significant amounts of applied research. We disagree on the need for continued funding for many of the applied programs but do agree that creating organizational designations within the DOE bureaucracy that fractures research is counterproductive.

Issue 3: The Missing Link Between Lab and Market

Applying federal lab research to solving real problems is ultimately one of the most realistic metrics available to determine the success of publicly funded research at the labs. The goal of research, publicly or privately funded, is, *ipso facto*, to advance the capabilities of the government and private sector to respond to specific mission requirements and support technology-based economic activity.

Industry collaboration with the labs should not be thought of as a dirty phrase when industry is picking up the tab. Today, if industry wants to purchase time on high-value machinery or partner with specialized laboratory experts to conduct proprietary research, lab management can only charge the total research, facility, and overhead cost of doing so, rather than charge more for high-demand infrastructure and services. Nonproprietary research such as that typically conducted by universities and published in peer-reviewed journals is not charged. In most cases, partnering with an outside entity goes through a merit-review process, which places nonproprietary research at a higher level of priority than paid proprietary research.

While this system works reasonably well to ensure that lab assets are available to all on a fair basis, it does not provide a strong mechanism to either capture the true value of an asset for the taxpayer or to incentivize lab managers to maximize the productivity of the labs' assets.

From industry's perspective, interacting with the labs is not as simple as negotiating within the framework of the five or six different DOE-lab-industry agreements. Over the years DOE has implemented increasing layers of requirements needed to process agreements. And nearly all technology-industry partnership or technology-transfer agreements require preapproval from the Department of Energy. By one account, the Idaho National Laboratory catalogued 110 requirements that the lab and researchers must meet to facilitate technology transfer.[20]

DOE site offices add yet another layer of interpretation that industry must navigate. As a result, partnering with industry can be as complex as negotiating within the four agreements interpreted 17 different ways (or 68 different agreements in addition to site-office interpretations). This leads to significantly different forms and industry payments for lab research, indemnification provisions, liability, and intellectual property, among other areas of negotiation.

DOE has partially responded to these issues by creating the Agreements to Commercialize Technology (ACT) pilot program, which ameliorates many negotiating issues by allowing the labs to agree to more flexible partnership terms, which dramatically shortens negotiating turnaround time. Most importantly, it allows the labs to offer performance standards at the contractor's own risk in exchange for a fee.

Under ACT, DOE receives advanced payment for research costs, and lab contractors are allowed to collect an additional fee for taking on specific performance risks above what

DOE is typically willing or able to take. In essence, it incentivizes the labs to interact with industry and provides a simpler system in which to do so.

Unfortunately, the ACT agreement—unlike CRADAs and WFOs—is limited to lab research partners that do not receive federal funding. In other words, if a company receives federal funding—such as a defense contractor, small business innovation research grantee, or biotechnology company working with National Institutes of Health funding—it is not eligible for the more flexible, performance-based ACT agreement. This limits the potential impact of ACT, since the kinds of technology companies would typically want to partner with the labs also tend to be the kinds of companies that are working within the federally funded R&D system.

Finally, conflict-of-interest laws and lab evaluation metrics quash culture of entrepreneurship. Conflicts of interest are a serious problem, and proper enforcement of laws to ensure that taxpayers support research for the common good above private profit is a must. An example of a conflict of interest is if a lab researcher simultaneously owns a stake in a company that stands to profit from the research he or she is doing for the lab. But overly conservative interpretations of conflict-of-interest laws effectively prohibit many forms of potentially useful collaboration between researchers and industry partners, prevent researchers from doing their best work in their field of expertise, and create a barrier between research and practice.

Part of the problem stems from lab legal counsels' different interpretations of conflict-of-interest laws. Similar to industry-partnership agreements, this disconnection results in different labs adopting divergent policies based on a reading of the same legal text. The Stevenson-Wydler Technology Innovation Act is clear about encouraging the labs to be proactive in resolving conflict-of-interest issues.[21] Yet many restrictive conflict laws remain on the books, and interpretations of how to enforce these laws vary from lab to lab. This makes it difficult for researchers to form innovative partnerships and creates the misconception that such partnerships are morally or ethically dubious.

In addition to weak incentives for individual researchers, the lab managers themselves do not have strong incentives to think creatively about the commercial applicability of their research and capabilities. Two issues with lab metrics complicate technology transfer: the lack of weight placed on technology transfer in lab-wide evaluation procedures and the lack of good metrics used within these evaluation procedures to measure technology transfer. Despite the congressional mandate to promote technology transfer and economic outcomes, DOE holds technology transfer as a relatively low priority on the annual PEMP report cards.[22] What little measurement of technology transfer does take place is measured in terms of intermediate research *outputs*—number of licenses, CRADAs, etc.—rather than mission *outcomes*—meeting research goals, problems solved, or market impact.

What Should Congress Do?

ITIF, Heritage, and CAP built consensus on a set of policy reforms to address the three

issues discussed above. Each will be summarized below and more detailed descriptions of each can be found in the report offered alongside this written testimony.

Congress should implement a performance-based lab-management accountability system

DOE should transition to a contractor-accountability model that places less emphasis on DOE oversight and more emphasis on transparent expectations and rigorous performance evaluation. In absence of DOE action, Congress should spur DOE action. This should include DOE adopting an expanded Performance Evaluation Management Plan (PEMP) process that becomes the focal point for lab stewardship and performance evaluation. Instead of requiring DOE review and approval for every transaction, lab management would assume decision-making authority and be held accountable through the PEMP. Contractors would be entrusted with the ability to make decisions for their labs while continuing to share all relevant information with DOE as requested under the Management and Operation (M&O) contract, the chief agreement and guidelines between the federal government and a third party to manage the labs.

Under these conditions, the labs would still follow federal workplace safety standards and meet environmental regulations, but additional oversight—such as rules governing the use of public research dollars for conference attendance, building construction and management, and human-capital management—would be negotiated as part of the M&O contract and then managed first and foremost by the labs themselves, rather than by site-office staff.

To execute this management realignment, Congress (or DOE) should take a two-step approach. First, the White House Office of Science and Technology Policy, or OSTP, and DOE either on its own or in response to Congressional mandate should create a task force to begin unraveling duplicative DOE regulation of the labs, including the size or need of DOE site offices. This task force would include representatives from key stake-holders, including lab directors, relevant sponsoring agencies and offices, lab contractors, and major outside science and industry users, and it would be tasked with reporting to the secretary of energy on how DOE can maintain necessary oversight of lab operations while removing excessive rules and accelerating bureaucratic processes. The task force should take one year to conclude its findings, at which point it would disband. The Secretary of Energy and OMB should then enact each recommendation within a reasonable amount of time set by the administration not to exceed six months.

Second, DOE should carefully change the annual performance-evaluation process through M&O contract negotiations, per the recommendations made by the task force. Negotiating the M&O contracts would fall under the proposed Office of Science and Technology (proposed below) in a consistent manner for at least the 14 non-NNSA labs and potentially for all 17 labs, given NNSA buy-in as M&O contracts come up for renewal or competitive rebidding. New language should be negotiated into the contract that clearly states the management practices lab contractors must follow.

Congress should increase lab budgeting flexibility

The labs should be given more leeway to direct their own overhead investments and decision making. To allow the labs greater flexibility in decision making, Congress should replace the existing accounting system with a single, accessible overhead account for lab managers. Congress could provide very broad rules on the types of investments that can be made but should move away from creating rigid accounting "buckets" that reduce budget flexibility.

This includes removing the existing 8 percent cap on LDRD spending and allowing the labs greater flexibility to spend their overhead to advance research.[23] DOE would then negotiate additional details on how lab managers can flexibly leverage overhead funds within the M&O contracts.

Congress should also increase budget flexibility by broadening the set of allowed activities that fall under overhead to include more aggressive technology-demonstration projects. In practice, this would enable the labs to spend overhead funds on projects that either removes technology barriers that limit private-sector interest or repurpose original research for new problems. In either case, these funds would leverage previous publicly funded research—that would normally sit on the lab shelf— and advance it closer to achieving potentially successful market outcomes.

To be clear, we do not propose that DOE and Congress give up control over federally funded research. Awarding the labs more authority and autonomy to decide how best to allocate overhead resources, however, would focus the interests of science and the nation on how to effectively meet short- and long-term goals. Devolving the decision-making process to those with the specialized knowledge to make the best decisions would also increase both the efficiency and effectiveness of the labs.

In some cases, OMB guidelines and statutory conflict laws may also play a role in preventing lab managers from having an efficient level of autonomy and resource flexibility, such as limits on how M&O contractors can finance infrastructure and building improvements outside of congressional appropriations.[24] In these cases, OMB and Congress should also act to modernize provisions identified by the proposed DOE task force through legislation and reform of OMB guidance.

Congress should restructure DOE by creating a unified Office of Science and Technology

Congress should merge the under secretaries of science and energy into one under secretary of science and technology and include relevant budget and stewardship authority (see Figure 3). In practice, this reform would place 13 of the 17 labs under one leadership office, instead of splitting control of the majority of the labs between many authorities.

Unifying both silos allows for two important changes. First, Congress should task the new under secretary for science and technology to develop and implement a single, expanded PEMP process for its 13 labs. This would allow a single DOE negotiating

partner to work with 13 M&O contractors, and it would establish a coherent and unified set of program-management and performance guidelines that could instill the expanded contractor accountability, or trust-but-verify system described earlier.

Second, Congress should task the new under secretary for science and technology to develop a unified strategic planning process across its 13 labs, so that the strategic plan of each individual lab is incorporated into a system-wide effort that produces annual 5- and 10-year research and facility plans and budgets. These reforms will only be functionally institutionalized under unified leadership for all science and technology labs.

Congress should facilitate DOE leading a stakeholder discussion on how best to combine the research functions under the new Office of Science and Technology

Institutionalizing a unified under secretary for science and technology opens the door to integrating the research functions managed by the existing Office of Science and undersecretary of energy structure. There are six basic research programs managed by the director of the Office of Science, for example, and five applied research programs managed by assistant secretaries underneath the Office of the Under Secretary of Energy. Unifying the research conducted among these entities would lead to new synergies across intrinsically related fields.

Congress should therefore replace the basic and applied research offices that artificially divide programs with a set of new offices focused on broad innovation areas (see Figure 3). These might include the Offices of Energy Innovation, Computing Innovation, Biological Innovation, Physics, and Environmental Research. Within these, grant makers and program managers can award funding to the best projects based on merit regardless of where they sit within the innovation lifecycle. While we are not recommending how to specifically combine the research functions, we are recommending that a larger stakeholder discussion take place with academia, the labs, and industry to inform the institutional changes and makeup of the new combined innovation offices. The goal would remain the same though: a more integrated approach to science and technology would help improve the mission impact of the office, compared to the stovepipe structure perpetuated today.

Congress should expand ACT agreements to federally funded entities

ACT provides many of the flexible terms and conditions absolutely necessary for the labs to increase their interactions with industry. In fact, ACT has the potential to bridge many of the gaps left by existing partnership agreements. For that to happen, DOE needs to first move ACT from pilot stage to availability for all labs. Second, the DOE should expand the application of ACT agreements to collaborations between a lab and a company that receives other federal funding. This would allow the labs to partner with private entities that receive other federal funding, as well as provide more negotiating flexibility for the labs in terms of risk, fee, and intellectual property with DOE preapproval. This would immediately provide the labs with a more customizable tool for working with industry and boost the number of lab-industry research collaborations. In absence of DOE action, Congress should do so independently.

FIGURE 3: Existing organizational structure of the Department of Energy, organized by office or program leadership.

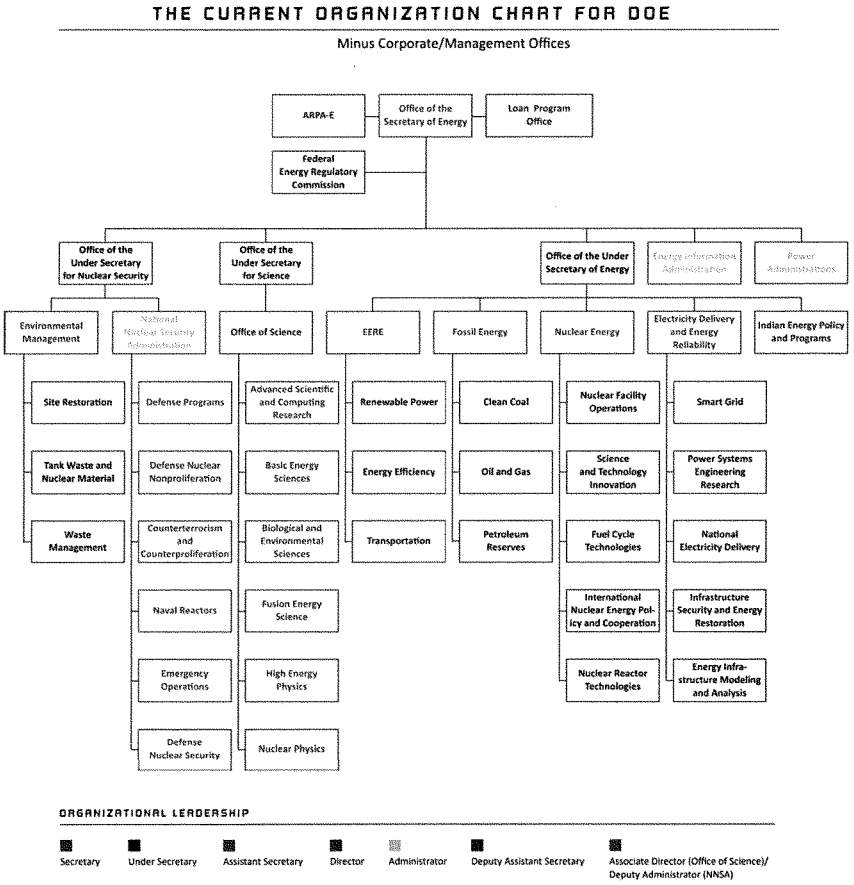
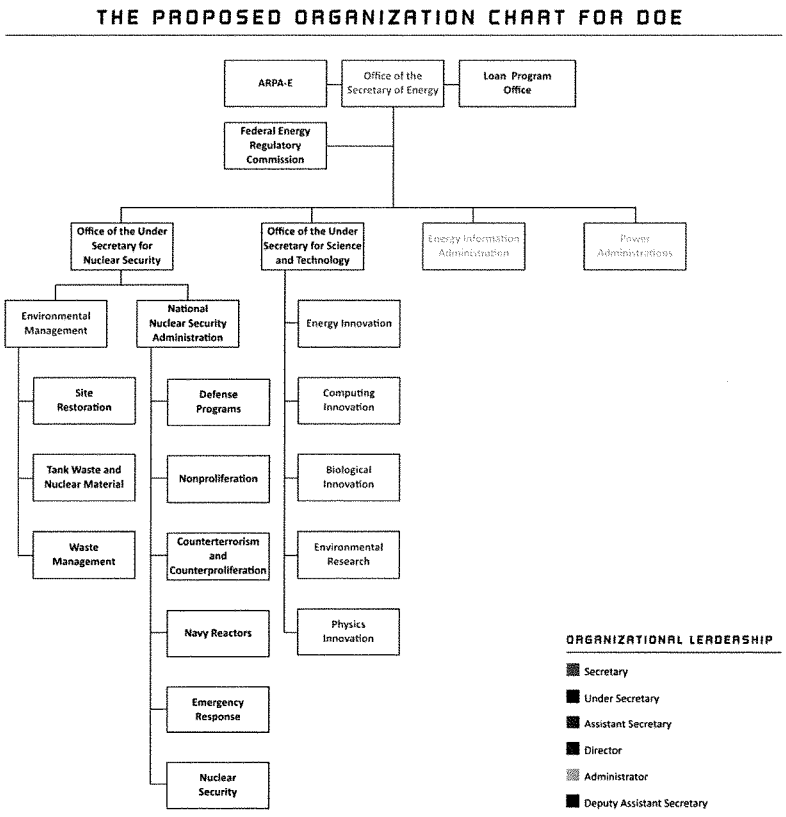


FIGURE 4: Proposed DOE organizational structure, organized by office and program leadership.



Congress should allow the labs to pilot new partnership models without DOE preapproval

With the shift toward a trust-but-verify accountability model, the secretary should grant labs the authority to pilot all of the partnership agreements without transactional DOE preapproval. To protect the national interest, only those existing agreement types would be included, but DOE should work collaboratively with labs to develop entirely new contracting templates if and where necessary and make the process of doing this simpler.

The lab managers would hold ultimate responsibility, liability, and accountability for any cooperative efforts negotiated under this program.

In accordance with other recommendations we make, these activities may not take precedence over government-needed research. And to ensure that national security is protected, foreign partners should be subjected to the same scrutiny that they come under when cooperating with the Department of Energy on any other project.

At first, such a program should operate within a limited size and scope of allowable arrangements, financial risk, and liability terms. Beyond those basic restrictions, the M&O contractor and its negotiating partner(s) should be free to determine other conditions of the agreement such as scope of activity, fees, personnel, and ownership of any intellectual property or physical products as a result of the research. The approach would maximize the lab's ability to meet market demand for its capabilities while minimizing the bureaucratic drag caused by DOE. But over time and in accordance with successful implementation, the pilot program could be expanded and eventually made permanent, giving the lab contractors much greater flexibility to actually manage the technology assets they are hired to manage.

Congress should allow the labs to use flexible pricing for user facilities and other assets

The labs have the tools to interact with industry—albeit they are complex, uneven, and often onerous to implement. But the labs have little motivation to *proactively do so*. In addition to providing the labs with greater flexibility in how they partner with outside parties, a new lab-stewardship philosophy should also provide greater incentives for the labs to do so. Congress should allow the labs to charge flexible rates for services regardless of full cost recovery. This would motivate the labs to pursue technology transfer and other cooperative efforts where the private-sector willingness to pay exceeds the accounting cost of lab capabilities. It goes without saying that any additional flexibility in pricing should not preclude any existing national-security protections.

Congress should increase the weight and implement better metrics for technology transfer in the expanded PEMP process

Instead of waiting to see what technologies emerge from the black box of research, the labs should involve market rationale in the research planning process. The annual PEMP process currently treats successful transfers of technology to market as mere afterthoughts. Elevating this important function to its own category would have significant impacts on the management philosophy of the labs and help reverse the buildup of decades of skepticism and intransigence toward commercialization.

Importantly, the new Office of Science and Technology could do this within the existing DOE authority, though in absence of DOE action Congress should act accordingly. The expanded PEMP contractor-accountability system proposed earlier could be made to include a new, ninth category of explicit evaluation, titled "Technology Impact." This category would evaluate the economic impact of lab-developed technology, creating a stronger incentive for lab managers to focus on market implementation of valuable

government intellectual-property assets and technical capabilities. Traditional metrics pertaining to CRADAs, WFOs, UFAs, and licensing would be used as a basis for this evaluation.

In addition, the previously proposed Office of Science and Technology Policy task force described above should be tasked with developing better metrics to measure technology transfer. Things such as economic impact, job-creation impact, revenue generating from spinoff technologies, and other market impacts of lab-developed research could be included among the traditional metrics of CRADAs and patents. Implementing these changes could likely be done through executive authority alone, in the context of better implementation of the Stevenson-Wydler Act, which already calls for labs to maximize commercial outcomes of publicly funded research to the greatest degree possible without compromising the government mission of the labs.

Conclusion

The reforms we propose above are designed to better position the labs to address the realities of innovation in an increasingly competitive, globalized, and knowledge-driven 21st century economy. They will provide the labs with the increased flexibility that they need to better engage with the private sector while still ensuring strong congressional oversight and stewardship of taxpayer dollars.

In the 21st century, as the speed and breadth of innovation increases and as the public sector and the private sector increasingly rely upon each other to solve problems and create solutions to shared challenges, the labs must evolve. Today's scientific and technological challenges and approaches rarely fit within narrowly defined boxes, and effective research and development management requires a big-picture view of the entire technology-development lifecycle. Now more than ever, basic research methods are informing critical industrial and commercial interests, while a fast-moving marketplace is informing the questions that scientists must ask of their research.

Implementing these reforms would be an important step toward better positioning the labs to tackle 21st century challenges. Increased management flexibility will allow the labs to do more with less. Better alignment between stewardship and funding will improve the ability for DOE to better articulate and implement strategic plans and system-wide missions. And more operating flexibility will allow the labs to make smarter decisions more informed by market realities, enter into productive partnerships, and contribute more fully to the U.S. innovation economy. We believe the end result will be more impactful research, more economic impact, more jobs, and wiser use of taxpayer dollars.

Endnotes

1. Estimates on National Lab budgets vary depending on whether totaling only Department of Energy research expenditures or also counting non-DOE and industry investment in lab research. The National Science Foundation Statistical Tables, for example, estimated that labs represented $12.632 billion in FY 2011, including stimulus spending but not NETL and SRNL. See National Science Foundation, "Federal Funds for Research and Development: Fiscal Years 2009–11" (2012), p. 46, available at http://www.nsf.gov/statistics/nsf12318/pdf/nsf12318.pdf. The National Academy of Public Administration estimated a total FY 2011 lab budget of $14.128 billion, not including NETL and SRNL. See National Academy of Public Administration, "Positioning DOE's Labs for the Future: A Review of DOE's Management and Oversight of the National Laboratories" (2013), p. 23, available at http://www.napawash.org/wp-content/uploads/2013/01/DOE-FINAL-REPORT-1-2-13.pdf. The Department of Energy disclosed SRNL's budget as $2.54 billion in FY 2011. See Doug Hintze, "Presentation to the SRS Citizens Advisory Board: Budget Update and Integrated Priority List" (U.S. Department of Energy, 2013), available at http://cab.srs.gov/library/meetings/2010/fb/hintze_cab_budget_ipl_update.pdf. NETL disclosed a FY 2012 budget of $815 million in addition to $600 million for managing EERE's Project Management Center. See National Energy Technology Laboratory factsheet at http://www.netl.doe.gov/publications/factsheets/corporate/NETL_flyer.pdf. The working group estimates a FY 2011 labs budget of $18.068 billion, which represents their budget appropriations as well as stimulus funding. Please note that because of stimulus spending, the labs budget in FY 2011 was larger than in previous funding years.
2. For information on the National Solar Thermal Test Facility, see Sandia National Laboratories, "National Solar Thermal Test Facility," available at http://energy.sandia.gov/?page_id=1267 (last accessed June 2013).
3. The National Energy Technology Laboratory is designated a Government-Owned, Government Operated facility, or GOGO, and is not managed by a contractor.
4. Homer Neal, Tobin Smith, and Jennifer McCormick, *Beyond Sputnik: U.S. Science Policy in the 21st Century* (Ann Arbor, Michigan: University of Michigan Press, 2008), p. 123.
5. National Institute of Standards and Technology, "Federal Laboratory Technology Transfer 2010, Summary Report to the President and Congress, Fiscal Year 2010" (2012), available at http://www.nist.gov/tpo/publications/upload/Fed-Lab-TT_FINAL.pdf.
6. Ibid. at 20.

7. National User Facility Organization, "Participation by Industrial Users in Research at National User Facilities: Status, Issues, and Recommendations: Preliminary Report" (2009), available at http://www.nufo.org/handlers/report.ashx?id=3.

8. PPPL, for example, hosts the National Spherical Torus Experiment, or NSTX, which is a unique magnetic fusion device that produces spherical plasma, which is a likely candidate for use in commercial fusion reactors. For more information, see Princeton Plasma Physics Laboratory,
"National Spherical Torus Experiment (NSTX)," available at http://www.pppl.gov/NSTX (last accessed June 2013); Office of Science, *The U.S. Department of Energy's Ten-Year Plans: Fiscal Year 2012* (U.S Department of Energy, 2012), available at http://science.energy.gov/~/media/lpe/pdf/2012-SC-Laboratory-Plans-for-Web.pdf.

9. Specifically, LANL hosts users across three facilities: the Center for Integrated Nanotechnologies, Los Alamos Neutron Science Center, and the National High Magnetic Field Laboratory. For more information on these facilities, see Los Alamos National Laboratory, "User Facilities," available at http://www.lanl.gov/collaboration/user-facilities/index.php (last accessed June 2013).

10. Suzy Tichenor, "Utilizing the Tools of Science to Drive Innovation through Fundamental Research," Statement before the Subcommittee on
Energy and Environment, Committee on Science, Space, and Technology, U.S. House of Representatives, June 21, 2012, available at
http://science.house.gov/sites/republicans.science.house.gov/files/documents/hearings/HHRG-112-%20SY20-WState-STichenor-20120621.pdf.

11. Sean Pool and Jennifer Erickson, "The High Return on Investment for Publicly Funded Research" (Washington: Center for American Progress, 2012), available at http://www.americanprogress.org/issues/technology/report/2012/12/10/47481/the-high-return-on-investment-for-publicly-funded-research/.

12. Bruce Harrer and Cheryl Cejka, "Agreement Execution Process Study: CRADAs and NF-WFO Agreements and the Speed of Business" (Richland, Washington: Pacific Northwest National Laboratory, 2011), available at
http://www.pnl.gov/main/publications/external/technical_reports/PNNL-20163.pdf.

13. Ibid. at 8.

14. Ibid. at 10.

15. For the U.S. Department of Energy's directive on LDRD spending, see Office of Information Resources, "DOD O 413.2B Admin Chg 1, Laboratory Directed Research and Development," available at https://www.directives.doe.gov/directives/0413.2-BOrder-badmchg1/view (last accessed June 2013). For a brief legislative history of LDRD, see "Legislative History of the LDRD Program," available at http://science.energy.gov/~/media/lpe/word/LDRD-Legislative-History-07-01-2011.docx.

16. See William Craig, "Laboratory Directed Research and Development Annual Report FY2012" (Livermore, California: Lawrence Livermore National Laboratory, 2012), available at https://st.llnl.gov/content/assets/docs/LLNL_12LDRD.pdf; General

Accounting Office, "Federal Research: Information on DOE's Laboratory-Directed R&D Program," Report to the Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives, April 30, 2004, available at http://www.gao.gov/products/GAO-04-489.

17. Craig, "Laboratory Directed Research and Development Annual Report FY2012," p. 4.
18. National Academy of Public Administration, "Positioning DOE's Labs for the Future," p. 25.
19. Figure data sourced from aggregate budget data described in endnote 2 using U.S. Department of Energy and National Academy of Public Administration budget disclosures for FY 2011.
20. Harrer and Cejka, "Agreement Execution Process Study: CRADAs and NF-WFO Agreements and the Speed of Business."
21. Stevenson-Wydler Technology Innovation Act of 1980, Public Law 96-480.
22. For a list of all the Office of Science report cards, see Office of Science, "SC Laboratory Appraisal Process: FY 2011 SC Laboratory Performance Report Cards," available at http://science.energy.gov/lpe/performance-appraisal-process/fy-2011/ (last accessed June 2013).
23. Section 309, Division C of the Consolidated Appropriations Act of 2008, Public Law 110-161, available at http://www.gpo.gov/fdsys/pkg/PLAW-110publ161/pdf/PLAW-110publ161.pdf. This authorizes the secretary of energy to authorize LDRD investments up to 8 percent of research funding provided to the labs by DOE.
24. National Academy of Public Administration, "Positioning DOE's Labs for the Future," p. 17.

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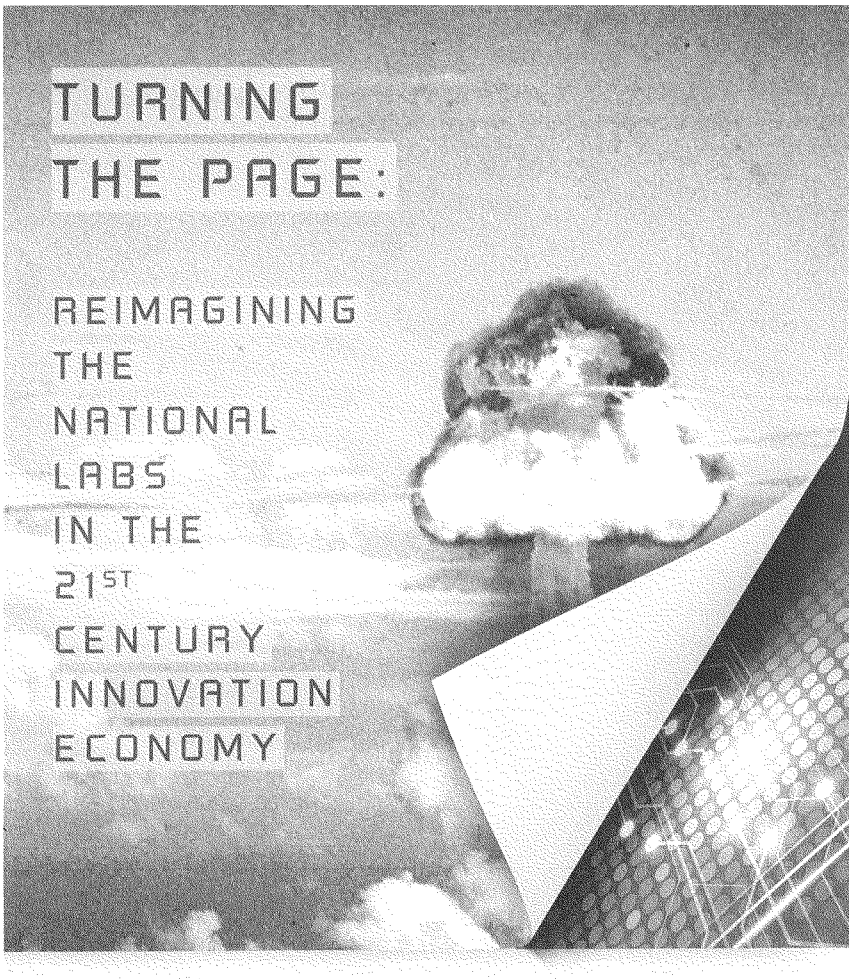

NONPARTISAN POLICY REFORMS FROM

The Information Technology and Innovation Foundation
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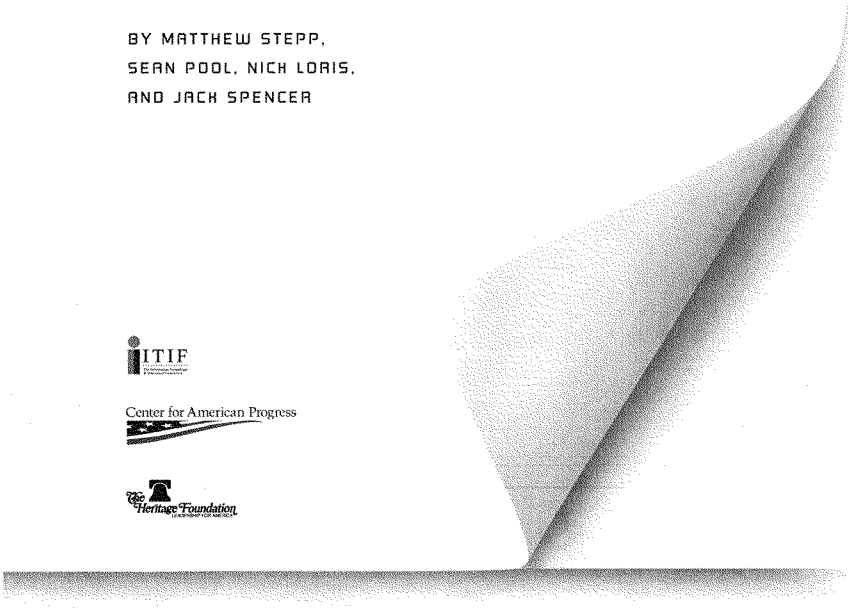
The Heritage Foundation

TURNING THE PAGE

REIMAGINING THE NATIONAL LABS IN THE 21ST CENTURY INNOVATION ECONOMY

BY MATTHEW STEPP,
SEAN POOL, NICK LORIS,
AND JACK SPENCER



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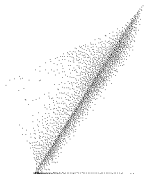

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EXECUTIVE SUMMARY

Since their creation in the 1940s, the Department of Energy's, or DOE's, National Labs have been a cornerstone of high-impact, federally funded research and development. The labs have helped seed society with new ideas and technologies in leading disciplines such as energy, biotechnology, nuclear physics, and material science. While the labs' primary mission must continue to focus on supporting the nation's research needs not met by the private sector, the time has come to move the DOE labs past their Cold War roots and into the 21st century.

As the United States moves deeper into the 21st century, the importance of advancing innovation becomes even more important if our nation is to thrive. Creating wealth depends on the use of traditional inputs such as natural resources, land, and labor, but most importantly, it requires the discovery and development of new ideas and technology. Today's science and technological challenges are increasingly complex and require multidisciplinary and often unique solutions that the labs can help provide.

While the pace of innovation and the complexity of national challenges have accelerated, the labs have not kept stride. Although private-sector innovation will remain the cornerstone of economic growth, lab scientists and engineers do important work that can be of significant future use to private enterprise. Examples include commercial global positioning system, or GPS, applications and genetics analysis. The problem is that the labs' tether to the market is weak, often by design. Though the mission of the labs must not be to subsidize private-sector research, efficient means for transferring scientific discovery into the market should exist. But the labs' bureaucracy remains largely unchanged and does not reflect the nimble characteristics of today's innovation-driven economy. Inefficiencies, duplicative regulations, and top-down research micromanagement are having a stifling effect on innovation. Furthermore, institutional biases against transferring market-relevant technology out of the labs and into the private sector reduce incentives for technology transfer.

The federal government must reform the labs from their 20th century atomic-energy roots to create 21st century engines of innovation. This report aims to lay the groundwork for reform by proposing a more flexible lab-management model that strengthens the labs' ability to address national needs and produce a consistent flow of innovative ideas and technologies. The underlying philosophy of this report is not to just tinker around the edges but to build policy reforms that re-envision the lab system.

The analysis presented by this working group represents a consensus between members of three organizations with diverse ideological perspectives. We may not agree on funding levels, funding priorities, or the specific role of government in technological innovation, and nothing in this report should be construed as support for or opposition to those things. Instead, the purpose of this report is to put forth a set of recommendations that will bring greater efficiency and effectiveness to the DOE lab system, produce more relevant research, and increasingly allow that research to be pulled into the private sector. These recommendations are as relevant to a large, highly funded research agenda as they are to a much more limited one.

Our analysis and policy recommendations fall into three major categories, which are summarized below.

TRANSFORMING LAB MANAGEMENT FROM DOE MICROMANAGEMENT TO CONTRACTOR ACCOUNTABILITY

Creation of a high-level task force to develop DOE-actionable reforms on lab effectiveness and accountability. The Department of Energy, together with the Office of Science and Technology Policy, should lead a top-to-bottom review of the lab-stewardship system with the goal of identifying and reducing redundant bureaucratic processes, reforming the relationships between the labs and the contactors who manage them, and developing better technology-transfer metrics. This report should be submitted to Congress within one year.

Transition to a performance-based contractor-accountability model. DOE should cede decision-making responsibility to lab managers instead of micromanaging the labs from Washington. This builds upon the existing contractor-assurance system, or CAS, and would free lab managers to operate more nimbly with regard to infrastructure spending, operations, human-capital management, and external partnerships. The labs should report to Congress annually during the transition period to the new accountability model to ensure critical congressional oversight of taxpayer resources.

Expand the Performance Evaluation Management Plan process to include a new accountability model. As an alternative to direct transactional oversight for all decisions, Management and Operation, or M&O, contractor performance should be evaluated annually via an expanded and unified review process for all the labs based on the DOE Office of Science's Performance Evaluation Management Plan, or PEMP, process.

UNIFYING LAB STEWARDSHIP, FUNDING, AND MANAGEMENT STOVEPIPES WITH INNOVATION GOALS

Merge the existing under secretaries of science and energy into a new Office of Science and Technology. The new, single under secretary would have both budgeting and stewardship authority for all of the labs except for those currently managed by the National Nuclear Security Administration, or NNSA.

Combine the research functions of the Office of Science and those of the under secretary for energy under the new Office of Science and Technology. Congress should create new, broader program offices under the Office of Science and Technology to better coordinate activities throughout the entire research spectrum.

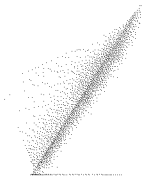
Remove top-down overhead accounting rules. Congress should remove prescriptive overhead accounting rules and allow labs greater latitude to use overhead funds to support project and mission success. This would include removing the cap on laboratory-directed research and development funds, also known as LDRD, and providing a more inclusive description of technology transfer.

MOVING TECHNOLOGY TO MARKET WITH BETTER INCENTIVES AND MORE FLEXIBILITY

Expand ACT agreements. The Department of Energy should expand the Agreements for Commercializing Technology, or ACT, template to allow for use with any kind of partner, regardless of whether the partnering entity has received other federal funding.

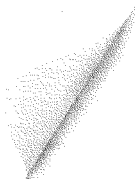
Allow labs to use flexible pricing for user facilities and special capabilities. Congress should remove legal barriers to allow the labs to charge a market rate for proprietary research and to operate technical facilities and capabilities at a level informed by market demand.

Allow labs autonomy in nonfederal funding-partnership agreements. The secretary of energy should grant the labs the authority to implement a pilot program that allows lab managers to agree to collaborations with third parties for research within the United States—through collaborative research and development agreements, Work for Others agreements, or other partnerships—absent DOE preapproval.



Add weight to technology transfer in the expanded PEMP process. DOE should create a new top-level category for the expanded PEMP process called "Technology Impact," which would evaluate labs on the transfer of technology into the U.S. private sector. The exact weight of this category would be negotiated in the M&O contract, based on the unique programs, capabilities, and strategic vision for each lab and DOE administration.

Execute consistent guidelines on conflicts of interest. The secretary of energy should issue new, consistent guidance to the labs encouraging research and management teams to partner with companies and entrepreneurs in the United States to avoid differing interpretations of laws and policies, including guidance on implementing consistent entrepreneurial leave and exchange programs.



PREFACE

We live in an innovation-driven economy.[1] In the 21st century the creation of new wealth and economic prosperity will continue to depend on the discovery and development of new ideas, new methods, and new technologies.

The American free-enterprise system has been an overwhelming contributor to many of these innovations and has been the greatest driver of American prosperity. The federal government has also played an important complementary role. Dating back to the founding of the Smithsonian Institute in 1846 and the land-grant college system in 1862, federal funding for understanding and harnessing science and nature has played a critical role in advancing the scientific knowledge that has driven much of America's economic growth.

Since then public support for science, technology, and engineering has been fundamentally important to developing much of the basic functionality that underpins a wide number of the industries and products we rely on every day, including smart phones, the Internet, microchips, parallel processing, GPS, computing, and genetic analysis, to name just a few. In none of these cases was the government's objective to create something commercially viable; rather, it was to develop a specific capability or to meet a national interest that was not available in the private sector. And in each case, private entrepreneurs were able to spin successful enterprises or products out of government research.

This public-private cooperation between government support for research and private-sector investment in transforming that research into new commercial products and industries continues today. One prominent example is the Department of Energy's National Laboratory system, a collection of 17 labs working on complex, multidisciplinary research to advance national scientific objectives that the private sector is unwilling to address and universities are often incapable of undertaking.

The labs were born out of the single-minded focus on building the atomic bomb. Of course, the labs were successful, which in part led to a quicker conclusion of World War II. And it led to U.S. nuclear capabilities that were a critical deterrent to the Soviet Union. Since the end of the Cold War, however, the nation has struggled to develop a new mission for the labs that effectively harnesses their unique capabilities or even justifies their existence as part of a comprehensive or rational public scientific enterprise.

The sad truth is that the institutional management structures that govern the labs have not advanced far beyond the Cold War, and is outdated, inflexible, and weakly connected to the marketplace, inhibiting U.S. innovation when we need it most.

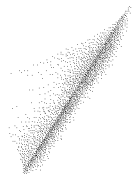
While the labs have served the public well in the past, the status quo is ill adapted for the needs of the 21st century. It wastes precious taxpayer dollars and denies society the benefit of scientific advances. Making the need for reform even greater, the United States finds itself at a time when technological and scientific innovation is becoming ever more important to economic success. That is not to say all basic research conducted in the labs will or should have commercial application, but it should have the proper opportunity should that be the case.

The underlying philosophy of this working group is not to tinker around the edges. Previous attempts to fix the lab system offered ineffective incremental changes and blue-ribbon commissions that are collecting dust in a Washington basement. Instead, this report aims to re-envision the lab system with an eye toward saving taxpayer money, reducing inefficient bureaucracy, increasing research competition, ensuring contractor accountability, and ultimately, boosting the flow of high-quality research and technology out of labs and into the market.

This working group brings together a diverse set of three organizations from across the ideological spectrum with different perspectives. The participants may not agree on funding levels, funding priorities, or the specific role of government in technological innovation, and nothing in this report should be construed as support for or opposition to those things. Instead, the purpose of this report is to put forth a set of recommendations that will bring greater efficiency to the DOE lab system, produce more relevant research, and increasingly allow the private sector to pull value out of that research. These recommendations are as relevant to a large, highly funded research agenda as they are to a much more limited one.

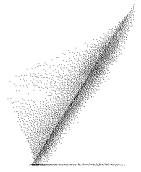
Furthermore, because the labs would have more flexibility to seek funding streams, the recommendations will allow the size of the lab system to be rationalized based on performance and on demand for its services. Lower federal budgets and low demand from private interests would lead to contraction. The opposite would also be true. This is another way that our recommendations are applicable to reformers of any political persuasion.

That said, after more than a year of research and engagement with the labs, DOE, industry, and academia, as well as countless hours of discussion, this working group does agree that:



- Federally funded research results in scientific discovery that can play a positive role in America's economic future
- Federally funded research at the labs should not replace or crowd out private-sector and university-based research
- Research should be driven by science and national needs, not special interest politics
- Washington should oversee the labs, not micromanage them
- Barriers preventing the movement of research from the lab to the market should be minimized
- Taxpayer resources should be used as efficiently and effectively as possible
- Market forces can help bring efficiency and rationality to the lab system
- The current system needs substantial reform

We believe that even in a time of policy gridlock in Washington, these nonpartisan reforms simply make sense. The labs have been largely running on autopilot for too long. A jolt to the system is needed now more than ever. It is our goal that this report spurs debate on lab reform but, more importantly, that it instigates tangible and constructive changes from Congress, the administration, the Department of Energy, and the labs themselves.



(Access the full report at http://www.americanprogress.org/issues/green/report/2013/06/20/67454/turning-the-page-reimagining-the-national-labs-in-the-21st-century-innovation-economy/)

Chairman LUMMIS. Thank you, Mr. Spencer. I now recognize Dr. Mason for five minutes.

TESTIMONY OF DR. THOM MASON, DIRECTOR, OAK RIDGE NATIONAL LABORATORY

Dr. MASON. Chairman Lummis, Ranking Member Swalwell, and Members of the Committee, thank you for the opportunity to address you today. My name is Thom Mason. I am the Director of the Department of Energy's Oak Ridge National Laboratory and I also serve as a member of the National Lab Directors' Council.

The Council is concerned about many of the issues being considered at this hearing, so I would like to thank the Information Technology and Innovation Foundation, the Center for American Progress, and the Heritage Foundation for stimulating this broader discussion.

As context for my remarks, I would like to briefly describe Oak Ridge National Lab. As DOE's largest science and energy lab, ORNL has an R&D portfolio that spans the range from fundamental science to demonstration and deployment of breakthrough technologies for clean energy and national security. Our mission includes both scientific discovery and innovation. So we place a high value on what we call translational R&D, coordinating basic research and applied technology to solve compelling problems.

Work with industry is a key part of this process and we have several tools for engaging with the private sector: The Department's Work for Others program; Cooperative R&D Agreements, or CRADAs; and the new Agreements to Commercialize Technology, or ACT; as well as user facility agreements that provide industry with access to powerful tools for R&D.

Building and operating user facilities is a signature role for the national labs. These facilities and their associated research programs add value to the innovation process. For example, at ORNL we have combined CRADAs and cost-share agreements to work with Caterpillar and Honeywell on a new alloy that is now in commercial use. This work has been advanced by neutron scattering measurements made at the High Flux Isotope Reactor. And we are helping large and small companies exploit the world's second-most powerful supercomputer to develop new energy technologies.

Other nations recognize the value of this model. Not long ago, the Director of the Institute of Policy and Management of the Chinese Academy of Sciences said that China is making progress in stimulating industrial innovation and beginning to build world-class universities but does not yet have an equivalent of the U.S. national labs. However, they are working on it. They are planning to move the world's most powerful supercomputer—you will note I said we were the second most powerful—from Guangzhou to Dongguan where the China Spallation Neutron Source is being built, and consideration is being given to shifting several major research institutes to an area north of Beijing where they can take advantage of a new synchrotron.

I think this demonstrates that the U.S. model remains valid, but nevertheless, we should always be looking for ways that we can improve.

You asked about potential improvements to the DOE, lab relationship, management practices, and oversight functions, and I believe that the GOCO, the government-owned contractor-operated lab model, has served the Nation well. Its flexibility has allowed the labs to respond to changing national priorities and issues. At Oak Ridge we recently used this flexibility to right-size our workforce, update employee benefits, and streamline our operations. We recognized the budget pressures that we all face. We benefited from having the kind of relationship with DOE that was specified in the early management and operation contracts which called for "a spirit of partnership and friendly cooperation."

But as the working group found, the GOCO model can certainly be updated and improved. The working group's recommendations fall into three categories. With regard to the first, transforming lab management, work to build a robust Contractor Assurance System has laid a solid foundation for a new look at stewardship.

The second set of recommendations speaks to DOE's organizational structure. Secretary Moniz has made a commitment to integrate the science and energy missions, and I believe that is an excellent move. He clearly understands the need to expand the kind of synergistic interaction between basic and applied research that already takes place at the laboratory level. And by combining at the Under Secretary level the R&D programs managed by the Office of Science and the energy offices under one Under Secretary, I believe that can be further advanced.

It would also allow for the extension of some of the best practices developed by the Office of Science in Laboratory Management and strategic planning to the energy programs.

The last set of recommendations on moving technology to the market, I think expanding the ACT mechanism would help the labs work with a wider variety of partners. It could provide a pathway to flexible pricing for proprietary R&D, which was another recommendation. And for labs whose R&D portfolios intersect the commercial world—which is not all of them, I might point out—adding weight to tech transfer in our performance plans would increase emphasis on this activity, particularly if we also gain flexibility in establishing and executing partnerships.

New metrics should address multiple aspects of industry engagement, not just licensing deals and revenue, however. And these metrics will need to take into account the high failure rate for all new technology ventures. It would also be helpful if our laboratory-directed R&D funds could be used to support tech maturation.

In closing, the working group's goal of ensuring that national labs remain effective and continue to deliver national benefits to the taxpayers is one we all share. I look forward to participating in a broad discussion of how we can best obtain it.

Thank you again for this opportunity to testify.

[The prepared statement of Dr. Mason follows:]

Statement of Thomas E. Mason
Director, Oak Ridge National Laboratory

Before the
Subcommittee on Energy
Committee on Science, Space, and Technology
U.S. House of Representatives
July 11, 2013

Hearing on Oversight and Management of Department of Energy National Laboratories and Science Activities

Chairman Lummis, Ranking Member Swalwell, and members of the Committee: Thank you for the opportunity to appear before you today. It is an honor to provide this testimony on the U.S. Department of Energy (DOE) and its national laboratories.

INTRODUCTION

My name is Thomas E. Mason, and I am Director of Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee. I am also a member of the National Laboratory Directors Council (NLDC), an organization formed by the directors of the 17 DOE labs.

The NLDC seeks to promote advances in the DOE missions of science, energy, nuclear security, and environmental management; increase the effectiveness of DOE and its labs through collaboration and coordination on high-level, strategic issues and concerns of broad interest; and provide a forum for presenting the Secretary of Energy and DOE senior management with consensus views on matters that affect the labs and their ability to contribute to the DOE mission. While I am speaking today on my own behalf, my participation in the NLDC has enlarged my perspective on the lab system. That perspective informs my views on the topics that you are considering today.

Many of these topics have already been raised at NLDC meetings, and I want to thank the Information Technology and Innovation Foundation (ITIF), the Center for American Progress (CAP), and the Heritage Foundation for focusing attention on them and stimulating a broader discussion. As the authors of "Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy" point out, the national labs play an important role in innovation, competitiveness, and the national research and development (R&D) ecosystem. Improving the labs' ability to deliver on their mission assignments and produce useful innovations that ultimately benefit the U.S. economy is a key to realizing the maximum return on the federal investment in R&D.

OVERVIEW OF ORNL

I want to begin by describing ORNL and its missions in science, energy, and national security to provide some context for my remarks.

ORNL is DOE's largest science and energy laboratory, with an R&D portfolio that spans the range from fundamental science to demonstration and deployment of breakthrough technologies for clean energy and national security. Our mission explicitly includes both scientific discovery and innovation, so we place a high value on translational R&D—the coordination of our basic research and applied technology programs to accelerate the deployment of solutions to compelling problems.

Most of our R&D is supported by various components of DOE, including the Office of Science, the Office of Energy Efficiency and Renewable Energy (EERE), the Office of Nuclear Energy, and the National Nuclear Security Administration (NNSA). In any given year, however, 15–25% of our funding is supplied by other federal agencies, state and local governments, and private-sector customers. Our major federal Work for Others (WFO) customers include the U.S. Department of Defense, the U.S. Department of Homeland Security, the Nuclear Regulatory Commission, and the National Aeronautics and Space Administration (NASA).

Nonfederal sponsors represent only a small part of our WFO portfolio (just over 10% in fiscal year 2012), but we use a number of other mechanisms to work with industry. One of the most popular is the Cooperative R&D Agreement, or CRADA, which was established by the Federal Technology Transfer Act of 1986. A study released in January 2013 by the American Energy Innovation Council, titled "Unleashing Private-Sector Energy R&D," described CRADAs as one of the most important mechanisms available to industry for joint research projects with national labs.

ORNL is also one of the eight national labs piloting DOE's new Agreement to Commercialize Technology (ACT), an alternative to traditional WFO arrangements that is designed to make it easier for private companies to work with us. We expect this new mechanism to provide a more flexible framework for negotiation of intellectual property rights to facilitate moving technology from the labs to the marketplace.

User facility agreements provide industry with access to forefront scientific facilities, at ORNL and other laboratories, where both proprietary and nonproprietary research can be conducted by scientists and engineers from other DOE labs, universities, and industry. Oak Ridge is home to eight designated user facilities, including the world's most powerful source of pulsed neutrons for research, the Spallation Neutron Source; one of the world's most capable research reactors, the High Flux Isotope Reactor; one of five DOE Nanoscale Science Research Centers, the Center for Nanophase Materials Sciences; and what is now the second most powerful supercomputer in the world, a Cray XK7 called Titan, which is the flagship system at the Oak Ridge Leadership Computing Facility (OLCF).

One of the signature roles of the national labs is the design, construction, and operation of these distinctive facilities, and substantial value results from the co-location of these resources with one another and with research programs that both draw on them and drive their development. For example, ORNL has used both CRADAs and cost-share agreements supported by EERE to work with Caterpillar and Honeywell on a new cast stainless steel alloy, CF8C-Plus, that is already helping diesel engine manufacturers achieve goals for higher efficiency. Neutron scattering measurements of residual stresses in weld joints between alloy turbine wheels and steel shafts

have been made at the High Flux Isotope Reactor, setting the stage for improving design and manufacturing processes for vehicle turbochargers. We have also established an Industrial Partnerships Program to provide companies with access to the high-performance computing resources of the OLCF. These resources, developed by DOE's Office of Science to drive discovery science, are being leveraged by large and small companies to accelerate innovation in energy technologies, from new turbomachinery for carbon capture and sequestration to aerodynamic components for the trucking industry.

As I mentioned earlier, we place a high value on translational R&D at ORNL. In my view, this is something that national labs are particularly well positioned to achieve, not only because of the co-location of research facilities, but also because of the labs' ability to assemble and deploy multidisciplinary teams to focus on compelling problems, often using their research facilities to find solutions. This has not gone unnoticed by our competitors in the global innovation economy. At a recent meeting of the American Association for the Advancement of Science, I heard a talk by the director of the Institute of Policy and Management of the Chinese Academy of Sciences. When the speaker was asked to offer his impression of how China was doing in cultivating innovation compared to the United States, he said that he felt they were making progress in stimulating industry to be more innovative and beginning to build world-class universities, but they still had no equivalent of the national labs. They are, however, working to address this. I mentioned that ORNL's Titan is the world's second most powerful supercomputer. The number one machine is China's Tianhe-2, which is currently located in Changsha. China is making plans to move Tianhe-2 to Dongguan, where it is building a spallation neutron source. In addition, there is discussion on shifting a number of institutes of the Chinese Academy of Sciences to an area north of Beijing, where a new synchrotron will serve as the same kind of "anchor facility" that is a feature of most DOE labs.

RECOMMENDATIONS REGARDING POTENTIAL IMPROVEMENTS TO DOE-LAB RELATIONSHIP, MANAGEMENT PRACTICES, AND OVERSIGHT FUNCTIONS

The government-owned, contractor-operated (GOCO) model is the fundamental basis of the DOE-lab relationship, and I believe that it has served the nation well. It was adopted by the Atomic Energy Commission in the early days of the national lab system, and its intent is neatly captured by a clause found in some early management and operation (M&O) contracts: "It is the intent of the Commission and the Contractor that this agreement shall be carried on in a spirit of partnership and friendly cooperation with a maximum of effort and common sense in achieving their common objectives."

The flexibility of the GOCO model has supported the evolution of the national lab system in response to changing national priorities and concerns. To give a recent example, a couple of years ago we launched an effort at ORNL to position the lab for a period of increasing budget pressure. This effort included a major workforce restructuring plan that eliminated 440 positions, a sweeping redesign of our employee benefits package, and a series of projects to streamline our operations. As a result, we were able to reduce our overhead rates by approximately 7% at the start of fiscal year 2013. Our ability to take this kind of action is due to the flexibility provided by the GOCO model, and to the "spirit of partnership and friendly cooperation" that is a key element of our relationship with DOE's ORNL Site Office.

That being said, the report from the ITIF/CAP/Heritage Foundation working group is correct in stating that a number of opportunities exist for updating and improving the GOCO model.

RESPONSE TO "TURNING THE PAGE" RECOMMENDATIONS

The working group's report presents a set of recommendations that are generally well thought out, and I look forward to exploring their implementation. My response is organized to align with the three major categories in the executive summary of "Turning the Page."

Transforming lab management from DOE micromanagement to contractor accountability

As a lab director, I am naturally interested in the recommendations on transforming lab management. I believe that work over the past several years to build robust contractor assurance systems lays a solid foundation for a new look at lab stewardship, and a wide-ranging discussion of how best to improve lab effectiveness and accountability by focusing on outcomes would certainly be valuable.

Unifying lab stewardship, funding, and management stovepipes with innovation goals

The working group's proposals for unifying lab stewardship, funding, and management stovepipes with innovation goals highlight the importance of a clearly aligned organizational structure. In fact, Energy Secretary Ernest Moniz has already made a commitment to integrating the Department's science and energy missions to move more easily from basic research through technology demonstration. I believe the recommendation to bring the R&D programs managed by the Office of Science and the energy offices under one under secretary merits serious consideration. Implementation of this recommendation would recognize that fundamental science and applied technology are conducted on a continuum that is not well served by artificial distinctions. Substantial integration between basic and applied programs already occurs at the lab level, and this could be further enhanced by drawing on models such as the Energy Innovation Hubs, which, in our experience, are well suited to the national lab environment and foster strong and valuable connections between labs, universities, and industry. In addition, this restructuring should facilitate the extension of some of the best practices in contract management, laboratory planning, and program management developed by the Office of Science to the energy programs.

As the working group's report points out, laboratory-directed R&D (LDRD) is a critical tool for driving innovation. Additional flexibility in the use of LDRD funds could help the labs in moving innovations toward eventual deployment. Under DOE's current interpretation of its directive on LDRD, however, the use of these funds for technology maturation is prohibited. As a result, the only funds available for technology maturation are royalties from previously licensed inventions. It is notable that the number of invention disclosures and patents from LDRD projects is disproportionately larger than that from programmatically supported projects; in fiscal year 2013 to date, LDRD projects at ORNL, which are funded at the level of less than 3% of the overall lab budget, are the source of 13% of our invention disclosures.

The working group also recommends removal of the 8% cap on LDRD funds. For ORNL and most of the labs under this Committee's jurisdiction, the cap on LDRD is not a concern; the

funds come from our overhead budget, which must support a number of other key functions, and this limits our investment. At the NNSA labs, where LDRD is an even more significant component of their open research portfolio, there are concerns about moves to further limit LDRD expenditures.

Moving technology to market with better incentives and more flexibility

My comments on the summary recommendations on "moving technology to market with better incentives and more flexibility" are as follows.

- **Expand ACT agreements.** Implementation of this recommendation would offer the labs a more customizable tool for work with a variety of industries; it would also provide a pathway to flexible pricing for proprietary use of user facilities and special capabilities and might well be the best way to accomplish this.
- **Allow labs to use flexible pricing for user facilities and special capabilities.** As noted above, this recommendation could be addressed through expansion of ACT.
- **Allow labs autonomy in nonfederal funding-partnership agreements.** Because a WFO agreement is effectively a modification of a lab's M&O contract, it is probably not realistic to eliminate DOE approval of such agreements. It should, however, be possible to streamline the WFO approval process by having DOE approve broad areas of potential engagement as appropriate scope for each lab. Labs could then manage within that scope, making use of the form of agreement that best suited a new partner's needs, and present any proposed WFO outside that scope to DOE for consideration. This approach could be used for both federally funded and nonfederal WFO.
- **Add weight to technology transfer in the expanded Performance Evaluation and Measurement Plan (PEMP) process.** For those labs whose R&D portfolios intersect the commercial world, implementation of this recommendation would increase emphasis on technology transfer, particularly if the labs also receive more flexibility in establishing and executing a variety of partnerships. Appropriate metrics would need to be developed to ensure that credit is given for a variety of forms of industry engagement (not just licensing deals and revenue). In addition, a note of caution is warranted here: as Sherwood Fawcett, then chairman of the Battelle Board of Trustees, remarked in testimony before the House Committee on Science and Technology in May 1985, "In general, the process of commercializing intellectual property is very complex, highly risky, takes a long time, costs much more than you think it will, and usually fails." Care must be taken to properly account for the high failure rate of any new technology venture in establishing technology transfer metrics.
- **Execute consistent guidelines on conflicts of interest.** Many labs have already taken action to address concerns about conflicts of interest as they work to establish appropriate mechanisms for fostering an entrepreneurial culture and developing productive industry collaborations. For example, ORNL employees are encouraged to be entrepreneurial, but our policy is that outside activities to be undertaken by a research staff member must be reviewed by the Office of General Counsel and a Research Conflict of Interest Advisory Council, and then approved by the Deputy Director for Science and Technology. A reaffirmation of the value of entrepreneurial activities by Congress and the Secretary of Energy would send a strong signal to the Department and the national labs in support of these activities.

CLOSING REMARKS

The working group's goal of ensuring that the national labs remain effective and continue to deliver national benefits to the taxpayers is one that we all share. The public funding that comes to the labs is based on the promise of a return to society in the form of discovery and innovation leading to clean and affordable energy, improved standards of living, a more secure future, and a vibrant economy. This promise is fully realized when the science and technology developed at the labs makes its way into the commercial world.

Our work to realize this promise means that rather than "largely running on autopilot," as suggested in "Turning the Page," DOE and its labs have already made substantial changes designed to accelerate the development and deployment of innovation to the marketplace. Most recently, Energy Secretary Ernest Moniz has stated his commitment to improving the management and performance of the Department—a commitment that, as I mentioned, includes plans to more closely integrate DOE's science and energy programs to drive the innovation process.

That being said, greater efficiency in transferring national lab discoveries and innovations to the market would strengthen the case for the investment of taxpayer funds in the national labs, and I welcome the opportunity to participate in the broad discussion of how best to move forward in attaining it.

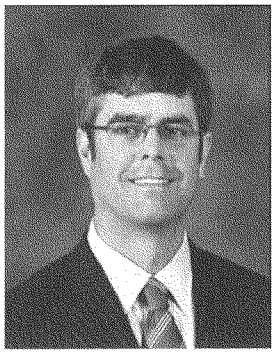
Thank you again for the opportunity to testify. I welcome your questions on this important topic.

Thomas E. Mason

Thom Mason (B.S. in physics, Dalhousie University; Ph.D. in condensed matter sciences, McMaster University) is director of Oak Ridge National Laboratory (ORNL). He joined ORNL in 1998 as Scientific Director of the Spallation Neutron Source (SNS) project and was named Associate Laboratory Director (ALD) for SNS in 2001 and ALD for Neutron Sciences in 2006.

Before joining ORNL, Thom was a member of the physics faculty at the University of Toronto. He was previously a Senior Scientist at Risø National Laboratory and held a postdoctoral fellowship at AT&T Bell Laboratories.

Thom's research background is in applying neutron scattering techniques to novel magnetic materials and superconductors. As Director of ORNL, the U.S. Department of Energy's largest science and energy laboratory, he has an interest in advancing materials, neutron, nuclear, and computational science to drive innovation and technical solutions relevant to energy and global security. He is a Fellow of the American Association for the Advancement of Science, the American Physical Society, and the Neutron Scattering Society of America.



Chairman LUMMIS. Thank you, Dr. Mason. And now, we will wrap up with Dr. Arvizu. You are recognized for five minutes.

TESTIMONY OF DR. DAN ARVIZU, DIRECTOR, NATIONAL RENEWABLE ENERGY LABORATORY

Dr. ARVIZU. Thank you, Madam Chair.

Ranking Member Swalwell and Members of the Committee, thank you for this opportunity to discuss the importance of the Department of Energy's national labs and the recent Reimagining National Labs Report.

I am Dan Arvizu, Director of the National Renewable Energy Laboratory in Golden, Colorado. I have been associated with Federal research in the national laboratory system throughout my mostly four decades' professional career. I started with Bell Labs. I worked 20 years at Sandia National Laboratories, and I have been at NREL for the past 8 1/2 years. I have also spent time in the private sector. I am currently Chairman of the National Science Board as well.

I am pleased that the Reimagining National Labs Report is drawing attention to this critically important item of high-impact research that can't or won't be supported solely by the private sector. The report certainly does make a number of sound and valuable recommendations, which is all the more impressive given the distinct ideology and political differences between the three organizations that sponsored it.

At the same time, the report readily concedes that the three sponsors did not achieve agreement on the three fundamental issues of the questions of funding levels, funding priorities, and the role of government. So while the report does offer a number of beneficial recommendations and I am very pleased to discuss those, we should not lose sight of the fact that we simply will not be able to optimize the impact of the national laboratories without also addressing these key questions of funding, priority and roles.

We shouldn't also overlook the fact that the overarching missions of the national laboratories are a key strength of the entire complex. The four DOE missions—national security, science, energy, environmental management—remain as vital and relevant to our Nation today as they ever have in our history. I strongly believe that these missions should continue to be the driving force in the continuing oversight and management of our laboratories and an essential element in any management reform efforts as well.

National security, science, energy, and environmental management have determined the core competencies and defined the key capabilities for the complex as a whole and each laboratory individually. And these long-identified and well-understood missions ideally should be the prism through which Congress, the Department of Energy, and the labs themselves make decisions on moving forward.

Let me take a moment to explain why the national labs, as unique national assets, should be nurtured with robust and continued investment. First, DOE laboratories are addressing critical national security, energy technology, and fundamental science. They conduct the world's leading scientific research; ensure that America will have an abundant, affordable, clean and reliable energy future;

and protect the Nation by keeping our nuclear deterrent reliable and safe.

Our national labs are the homes of scientific and engineering capabilities that are the engines of innovation and allow us to compete in a rapidly evolving global economy. These capabilities tackle our long-term problems but also our near-term emergencies such as the labs' responses to events like the Gulf oil spill and the 9/11 attacks, and Hurricane Katrina, and Super Storm Sandy.

Our national labs design, build, and operate unique scientific instrumentation and steward research and user facilities serving tens of thousands of scientists and engineers from both the private sector and academia.

With respect to the report conclusions, I would strongly agree that there is no bright line between basic and applied research. If you want to be market-relevant, you can't separate the crucial role played by applied research working in concert with more fundamental research, as is frequently practiced within our national laboratories.

Additionally, to further grow U.S. competitiveness, I can clearly report that we should accelerate commercialization by putting more emphasis on tech transfer in the context of the mission objectives.

One of the principal conclusions of the report is that the historical model of organizing and managing national labs as government-owned, contractor-operated facilities is fundamentally sound, but has eroded over time. I agree. The Department and the lab complex should work together to recapture the best elements of the original GOCO model, with the Department giving laboratories direction on what needs to be done and the laboratories being able to decide how to do it. I am pleased to say Secretary Moniz is working to that end. Additional flexibility and accountability are key to achieving that objective.

Finally, the inconsistency of funding different labs, different lab functions, and maintaining lab infrastructure is a systemic problem that must be addressed. Apart from designated user facilities, the reality is that labs don't often receive the funding they need to adequately steward the national capabilities on their campuses. This results in inconsistent performance across the complex and it means that industry and universities face obstacles and considerably higher costs in partnering with laboratories.

In conclusion, I applaud the authors of the report for underscoring a very important question, and that is how can we best martial our national research resources to surmount the critical challenges of our time and the uncertain challenges of our future.

Thank you for your attention. I look forward to answering any of your questions.

[The prepared statement of Dr. Arvizu follows:]

Prepared Statement of
Dr. Dan Arvizu
Director, U.S. Department of Energy's National Renewable Energy Laboratory
For the House Committee on Science, Space & Technology Subcommittee on Energy
Hearing on Oversight and Management of Department of Energy
National Laboratories and Science Activities
July 11, 2013

Chairman Lummis, Ranking Member Swalwell, and members of the Committee, thank you for this opportunity to discuss the importance of the Department of Energy's National Laboratories, and the recent report, *Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy.*

I am Dan Arvizu, director of the National Renewable Energy Laboratory (NREL) in Golden, Colorado. From the beginning of my career I have been associated with federal research and the National Laboratory system, starting at Bell Telephone Laboratories in 1973 and subsequently transferring to Sandia National Laboratories where I worked for more than 20 years. I have been at NREL for more than 8 years. Over my career, I have held technical staff, management and leadership positions in basic science, applied research and technology development, and in technology transfer. I've also spent time in the private sector, both directing corporate R&D, and running an energy business. I am in my second term on the National Science Board (NSB), with exposure to the vast investment the country makes in the National Science Foundation. I am currently serving as NSB Chairman.

I'm here today to speak to the importance of the DOE National Laboratories from the perspective of my personal professional experience, and also representing that of my colleagues from the National Laboratory Directors Council (NLDC), which is comprised of the directors of the 17 DOE National Laboratories. My first point in this testimony is to assert that history shows, and the aforementioned report acknowledges, the National Laboratories to have created unparalleled value for our nation, and because of this, these unique national assets should be nurtured with robust and continuing investment.

The Value of our National Labs

I am pleased that the report, *Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy,* has drawn attention to the critical need for federal investment in the kind of high-impact research that transcends that which is conducted by universities, and which can't, or won't, be supported solely by the private sector. I believe I represent the

collective position of my fellow laboratory directors when I say that the National Laboratories comprise as vital a national resource today, as they ever have. Let me explain.

First, DOE laboratories are addressing critical problems in national security, energy technology and fundamental science. Our labs collaborate with academia and with industry to develop and deploy scientific and technological solutions to our national needs.

Specifically:

- They conduct the world's leading research in the physical, chemical, biological and our computer and information sciences, which gives us essential understanding of the world around us;
- They are enabling us to fully utilize our vast domestic energy resources, and are ensuring that America will have an abundant, affordable, clean, and reliable energy future;
- They help protect the nation by keeping our nuclear deterrent reliable and safe, and assist on a global scale by helping prevent the proliferation of weapons of mass destruction.

Second, our National Laboratories are the home of scientific and engineering capabilities that are essential to our nation's continued primacy in science and technology – and that's an invaluable card to play as we compete in a rapidly evolving global economy. We use these capabilities to address long-term national problems, but we also press them into service for nearer-term emergencies, as evidenced by the labs' responses to the Gulf oil spill, to the 9-11 attacks, and the disasters left in the wakes of Hurricane Katrina and Superstorm Sandy.

Third, National Laboratories design, build and operate unique scientific instrumentation and research facilities that serve tens of thousands of scientists and engineers, from both private industry and academia. I'm proud to say that both the facilities and the research staff of our National Laboratories for decades have been, and remain, the envy the world.

And fourth, National Laboratories generate the innovation that contributes to U.S. competitiveness and our future prosperity. We partner with industry to integrate fundamental and applied research to advance a broad range of crucial technologies, thereby enhancing U.S. global competitiveness. Our laboratories continually accomplish this by making key scientific discoveries, demonstrating these discoveries in early prototypes, and working with industry to move these technologies into the marketplace --- and creating high-paying, private-sector jobs along the way.

The "Turning the Page" Report

It's important to note that the "Turning the Page" report reflects many good insights into the value the labs provide. Each section of the report demonstrates respect for the institutions in question, a firm grasp of the key issues we are facing, and a driving commitment to make changes to meet future needs.

The report especially focuses on how the labs spur innovation to enhance national competitiveness. I would agree that's an essential reason the Lab's exist, and it continues to be one of the major benefits the laboratories provide our nation.

It's also important to remember the distinct purposes of our National Laboratories. In the decades since the defense needs of the nation gave birth to the DOE laboratory complex, lab missions have expanded to help solve vexing national challenges. These four missions – national security, science, energy, and environmental management – remain relevant to the nation today, and will remain relevant for the foreseeable future.

For example, if you examine the complex issues revolving around the management of the nuclear weapons stockpile, or addressing the environmental issues from the legacy of past nuclear materials research and production, you will come away with a keen understanding of why National Laboratories continue to work on these challenges.

One area where I and perhaps other Laboratory professionals would agree with the report is its discussion of basic and applied research. The report acknowledges the reality that there's no bright line between basic and applied research. My institution, for instance, the National Renewable Energy Laboratory, is often described as an applied science and technology institution. But in reality, we've learned through more than three decades of successful renewable energy and energy efficiency technology R&D, that there's no dichotomy between pure science and use-driven science. Moreover, what may be considered "applied" research in the lab environment may often be regarded as "basic" research by industry, and deemed out of reach for even the most research-driven companies.

The field of biofuel research today provides a useful example of how this works. Our first forays into turning plants into fuel were based on centuries of making beer and wine – the basic fermenting process that makes alcohol fuels like ethanol from sugars derived from grains. And where we first started with an "Edisonian" trial-and-error approach, today we're reaching back to look at this process at a molecular level, employing electron microscopes, computational thermodynamics, advanced computer simulation and visualization, and other tools to truly

understand the incredibly complex processes at work. Those insights are allowing us to develop new technologies that produce new energy-rich options that have the best traits of fossil fuels like gasoline, but are created using renewable, sustainable and environmentally-benign cellulosic biomass resources, which don't compete with our food supplies.

This is but one of many, many examples throughout the lab complex where fundamental and applied research must work hand-in-hand if we are to achieve our national goals. This truism is confirmed by the fact that three of the leading U.S. solar photovoltaic technologies – today owned by industry leaders General Electric, Dupont and First Solar – each evolved separately from pilot-scale to commercial-readiness by way of a public-private partnership program, which teamed what were then smaller, original-technology start-up companies, with the world-class research expertise and one-of-a-kind facilities of a National Laboratory. Today we have a clearer understanding: When it comes to fundamental science and applied science – each works best when both work together.

That really is drawn into focus when one considers the need to innovate for national competitiveness. National Laboratories are at this center of innovation, stimulating competiveness and industrial growth by reducing the risk of moving new technology into the marketplace. If you want to impact the economy, America's industries, and job creation in the most efficient, effective and quickest ways possible, you can't minimize the crucial role played by applied research working in concert with more fundamental research at our National Laboratories.

The fruits of that research are evident throughout our nation's economy, and have contributed mightily to U.S. competitiveness. Research that began in 1986 into specialized airfoils for wind turbines – and has continued on everything from gearbox design to advanced electronic control systems – has directly enabled turbine manufacturers like General Electric to be world leaders, and wind power to become the leading new source of electrical generation it is today. Even today, the science of aeroelasticity is as relevant to wind power as it is to aerospace.

A National Laboratory also put the jolt in the Chevy Volt. The advanced cathode technology born out the labs is essential to the innovative electric vehicle's power system, and the labs are also at the forefront of research into longer-life, lower-cost Lithium-Ion battery technology that promises to revive the U.S. battery manufacturing industry.

The thin-film solar panel technology employed by the leading U.S. manufacturer, First Solar, was created in a National Laboratory, and continued work with that industry has resulted in an acceleration of new, more efficient, and cost effective technology into the marketplace. Innovation in the labs is focused on solving problems, and it isn't limited to hardware. To

overcome the high infrastructure costs and deep entrenchment of existing resources and technologies typical throughout the energy sector, NREL in particular has been working with the financial community to identify and overcome the financing impediments that have held back otherwise viable renewable technologies. Informed by stakeholders, NREL has been researching the potential of Real Estate Investment Trusts (REIT), Master Limited Partnerships (MLP), asset-backed securities and other liquid vehicles currently available in the market for investment, to be applied to financing renewable energy markets.

Innovations in cholesterol diagnostics, new refrigerants, improved water treatment technologies, biofuels, magnetic levitation technology, nanoscale machines, improved airport security, zero-net-energy building technology, the maturation of light-emitting diode technology, dynamic windows, and thousands of others discoveries, have all come out of our National Laboratories, and have spurred economic expansion and jobs across the United States.

In each of these instances, the technological breakthroughs that have enabled more rapid commercial adoption would not have occurred if left solely to industry. Our industry partners readily and repeatedly tell us this is so. The R&D performed by National Laboratories is larger-scale, longer-term, and higher-risk, than the private sector will undertake. Thus, the rewards are commensurately higher to U.S. competitiveness as a result of the research performed by National Laboratories.

To sustain and further grow this U.S. competitiveness, we agree with the report that by putting more emphasis on technology transfer, DOE could accelerate commercialization of laboratory innovations. Some of the measures being taken by DOE, such as piloting the Agreements for Commercializing Technology, and expanding the Technology User Facility model, would enhance the labs' ability to partner with industry and move lab technologies to the market. Establishing technology transfer expectations and benchmarks is an important performance management signal that Congress can establish for DOE, and that DOE can provide laboratory M&O contractors. In addition, clearer guidance from DOE on greater use of entrepreneurial leave and exchange programs could also improve technology transfer.

As the dialogue around the proper role of National Laboratories continues, we should not lose sight of what is a simple, yet overarching goal: that of ensuring the marketplace actually adopts the advantageous technologies produced by the labs. Our objective must not be to collect novel patents because they look impressive on the wall. Rather, our objective should be to conduct the essential research needed to develop important new technologies, reducing the technical and investment risk to the point where industry can then bring that technology to the marketplace, where it can benefit the nation.

Improving Strategic Planning and Management Systems

The report, correctly in my opinion, discusses the need for long-term, strategic planning for the Department, and the 17 National Laboratories. It discusses DOE's Quadrennial Technology Review, which was completed in 2011, and suggests that concept could be improved through additional coordination between the various funding entities, and an ongoing process to keep its findings up to date.

Encouragingly, the new Secretary of Energy has come into office with a deep understanding of this and other real and perceived shortcomings in the department, and has committed to making improvements to those a hallmark of his tenure.

Secretary Moniz already has laid out an ambitious agenda some of which he has shared in his June 18, 2013, testimony before this committee for reshaping the Department to better meet the nation's needs. I'm pleased to say that forging a new Quadrennial Energy Review process, one that will candidly consider the nation's energy situation, and apply the Department's resources, including the National Labs, to meet those challenges, is one area near the top of his list.

One area heavily mentioned in the report is that of reorganizing the Department for a more effective DOE management structure and process. While I cannot say how the report's recommendations on management structure will be incorporated by the Department, I can see that Secretary Moniz recognizes the need for integrated planning across the Department, which includes strategically using all of the national laboratories.

Optimizing "Government-Owned, Contractor-Operated"

One of the principal conclusions of the report is that the historical model of organizing the National Laboratories, as government-owned, contractor operated entities, or GOCOs, is fundamentally sound, but over time has lapsed into something less effective. The report notes that by having the government own and direct the Labs, and having private contractors operate them and perform the work, the GOCO model would realize the best of both worlds. In this way, contractors could be free to staff the labs with highly specialized technical expertise and utilize the best management practices from business, while the government provides the big-picture mission and ensures funding.

The report notes that over time, those distinct roles of DOE and its contractors have eroded and become blurred. Issues of micromanagement, of the Department fostering burdensome practices, have indeed occurred. It should be noted that the previous Energy Secretary

recognized this very subject, and he and the National Laboratory Directors jointly embarked on a process to identify and streamline burdensome procedures.

To address this for the longer term, what's needed most is not a massive overhaul of the Department, or its relationship with the Laboratories. The concept of having the best lab contractors – whether they are non-profit research institutions, universities, or for-profit corporations – manage the federal government's research facilities remains as an effective a model today, as it was when it was first envisioned.

The Energy Department and the Lab complex should work together to recapture the best elements of the original GOCO model, and adapt those to the today's modern management and system needs. To put that in nutshell: the Department of Energy needs to give the laboratories direction on "what" needs to be done; the laboratories in turn need to be able to decide "how" to do it. Of course, there should be checks and balances in the system with proper accountability by all.

That's doable, I believe, and it's part of broader changes already underway. Secretary Moniz has talked about working with the leadership of the labs in a much more strategic way, where Laboratories have the independence they need, and the Department has the role of guidance and oversight it needs as well.

Evolving Needs Mean Evolving National Laboratories

There are other changes afoot across the Laboratory complex. In recent years, we've seen any number of Lab functions evolve beyond their original charters and purposes, adapting to new realities. If viewed collectively, the National Laboratories have demonstrated remarkable flexibility to meet the nation's new challenges.

With these changes, there is some duplication of capabilities within the complex. We must remember that a portion of that duplicative function is in fact vital to research. History confirms that competition over ideas can drive innovation, producing more technological pathways and better economic options for overcoming a difficult challenge. Regional access requirements and the ability to have independent peer review at the same level of expertise, are additional reasons for maintaining parallel capabilities. However, wherever we can identify ways to streamline the laboratory system to provide the best return to the American taxpayer, we must work with Congress and the Department to do so.

Aligning the research agenda with the needs of U.S. industry is a worthy goal highlighted in the "Turning the Page" report. So is the notion of revisiting the concept of Performance Evaluation and Measurement Plans, or PEMPs. Within the Laboratory system, there are many inconsistencies in how these plans are developed, what they mean, and how they're

administered. The Department, working directly with the Laboratories, should develop a uniform competency stewardship strategy, one that provides universal standards, but at the same time allows the respective funding DOE program office to tailor Lab-specific plans to fit the differing DOE missions and objectives of each individual lab.

Sustained Competency Stewardship of the Laboratories

The inconsistency of funding different labs, and different lab functions, is a systemic problem that must be addressed. Apart from designated user facilities, the reality is that labs often don't receive the funding they need to adequately steward the national capabilities on their campuses. Some labs, and their associated infrastructure within those labs, directly receive so-called "facilities and infrastructure" funds to maintain and safely operate their key research buildings. Others don't – they must tap into various program funds and find other ways to keep their labs running. The result is that there are widely varied cost structures across the National Laboratory system, with some labs unable to capture their actual cost of doing business in any consistent fashion.

This results in inconsistent performance and outcomes across the complex, and it means that industry and universities face considerably higher costs in partnering with the labs in certain fields, as compared with others. To meet the important goal of working with industry to produce real-world innovation, we know we must strive to reduce our costs of doing business. Yet most of our cost of doing business lies in the need to maintain and operate facilities. We need to address the issue of facility funding (potentially through external peer reviewed competency assessments) if we are to get the most from these national assets.

"Reimagining" These National Assets

I was particularly impressed by the operating phrase in the title of the report we are considering here today: "Reimagining the National Labs." In my opinion, that's the right way to think about this issue. Labs already are reimagining themselves to better fit future needs. In many cases, National Laboratories have become more multi-program oriented, and more reliant on integrated systems to achieve their research missions. Labs today are evolving in many of the same directions advocated by the report. You can see this in how the organizational structures, the management systems and the on-the-ground, operational realities of individual laboratories have dramatically changed in recent years.

Finally, I applaud the authors of the "Turning the Page" report for underscoring a very important question, namely: How do we as a nation best marshal our national scientific and engineering resources to surmount the most critical challenges of our time, and remain at the ready to address the uncertain challenges of our future. We should all be gratified that this question is getting the attention it deserves.

Dan E. Arvizu became the eighth Director of the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) on January 15, 2005. NREL is the Department of Energy's primary laboratory for energy efficiency and renewable energy research and development. NREL is operated for DOE by Alliance for Sustainable Energy, LLC (Alliance). Dr. Arvizu is President of Alliance and also is an Executive Vice President with the MRIGlobal, headquartered in Kansas City, Missouri. Prior to joining NREL, Dr. Arvizu was the chief technology officer with CH2M HILL Companies, Ltd. Before joining CH2M he was an executive with Sandia National Laboratories in Albuquerque, New Mexico. He started his career and spent four years at the AT&T Bell Telephone Laboratories.

In 2011, Dr. Arvizu was appointed by President Obama to a second six-year term on the National Science Board, the governing board of the National Science Foundation and the national science policy advisory body to the President and the Congress. Dr. Arvizu serves on a number of Boards, Panels and Advisory Committees including the American Council on Renewable Energy Advisory Board, the Singapore Energy International Advisory Panel, the Great Minds in STEM Board of Directors, the Colorado Renewable Energy Authority Board of Directors, the Stanford Precourt Institute for Energy Advisory Council, and is Fellow of the National Academy of Public Administration.

He has a Bachelors of Science in Mechanical Engineering from New Mexico State University and a Master of Science and Ph.D. in Mechanical Engineering from Stanford University.

Chairman LUMMIS. Thank you, Dr. Arvizu. And thank all of you for being available for questioning today.

I am reminding Members that the Committee rules limit questions to five minutes. The Chair will, after one other housekeeping matter, start the opening round of questions.

I do, before we begin that, ask unanimous consent to enter into the record a letter from Secretary of Energy Ernest Moniz responding to a letter Ranking Member Swalwell and I sent him in late June of this year regarding the national labs. And I say that because it has only been two weeks since we sent him the letter and we have already gotten a response. So we are off to a great start in terms of our working relationship with the Secretary and I want to compliment him on his prompt response. Without——

Mr. SWALWELL. Still hopeful he will take us up on our offer to visit Wyoming and California.

Chairman LUMMIS. Indeed. And we are really looking forward to a positive working relationship with the Secretary.

So without objection, so ordered.

[The information appears in Appendix II]

Chairman LUMMIS. And without further ado, the Chair recognizes herself for five minutes in this first round of questioning.

The Reimagining National Labs Report is primarily focused on the structure of the 16 government-owned, contractor-operated labs. However, there is this unique critter in the DOE lab system. It is a government-owned, government-operated lab, the National Energy Technology Lab, which conducts fossil fuel R&D. I would like to ask each of you is there any reason that the fossil fuel lab should not also be contractor-operated empowering it to take advantage of the operational efficiencies and flexibilities associated with private management and the report's recommendations? When any of you like to respond to that question?

Mr. Stepp, thank you.

Mr. STEPP. I will just jump in and say there is no management operation or scientific reason why it shouldn't be contractor-operated. I think maybe the lab directors can provide more of a history and why NETL was—remains a GOGO, but I think the recommendations we outlined in the report are fully applicable to NETL moving forward in addition to making it a contractor model rather than a government operation model.

Chairman LUMMIS. Mr. Spencer?

Mr. SPENCER. Yes, I would certainly agree with that. If you look at what NETL does, where its funding comes from, its missions, to me it is unclear why the government is involved in any of those things at all for the conventional fuels industry. So at a minimum I think it is appropriate to make it a GOCO, and one may make a strong argument for going even beyond that.

Chairman LUMMIS. Dr. Mason?

Dr. MASON. I could maybe offer a bit of a historical perspective on that distinction because it does stand out as a bit of an anomaly. It has its origins in the way that DOE was created in the '70s in response to the Arab oil embargo when the Atomic Energy Commission was broken apart into a regulatory component, the NRC, and something that became the Energy Research and Development

Agency and ultimately DOE that incorporated elements from other government agencies like Interior.

And NETL came from that side of the equation, the Interior side of the equation, so it had been operated as a government-operated entity whereas the Atomic Energy Commission had the GOCO tradition going back to the Manhattan Project. And I think the reason it persists is because of the difficulty of the transition, and that is really the challenge. It would be complicated to do and, you know, there are lots of stakeholders involved, and sometimes these things are hard to get to.

Chairman LUMMIS. Dr. Arvizu?

Dr. ARVIZU. Yes. And that, by the way, would be a great question to ask Secretary Moniz.

Chairman LUMMIS. Okay.

Dr. ARVIZU. I think he clearly has some history with this and I believe there has been evaluation of making that conversion in previous times. And I think it would have to be carefully considered based on mission objectives and things that are part of that. But I agree with what my colleagues have said.

Chairman LUMMIS. Thank you. While you have the microphone, Dr. Arvizu and Dr. Mason, about how many of the WFO, CRADA, and ACT agreements are your labs partner to would you guess?

Dr. ARVIZU. Total number of agreements?

Chairman LUMMIS. The agreements for commercializing technology, how many of those have you used roughly? I mean very roughly.

Dr. ARVIZU. Yes. I will give you a crisp answer, we have over 130 active Cooperative Research and Development Agreements. We have a total of 400 and change number of agreements that relate to Work for Others, Technical Services Agreements, and other forms of relationships that we have with industry. It is part of our mission to work with industry. And as a consequence, I think we probably have the lion's share of those relative to other national labs.

Chairman LUMMIS. Okay. Dr. Mason?

Dr. MASON. I don't have the exact numbers but I do know that we interact with close to 1,000 companies through a variety of different mechanisms like the CRADAs, Work for Others, and user agreements. ACT is a new mechanism. We received approval to participate in the pilot for that earlier this year, and so we are just in the process of negotiating the first ACT agreements.

Actually, interestingly, one of the first ones may be with our state government who found that the flexibilities embedded were equally important to them although it was originally imagined that it would be most valuable for industry.

Chairman LUMMIS. Thank you, Mr. Mason.

I now recognize Mr. Swalwell for five minutes.

Mr. SWALWELL. Thank you, Chairman Lummis.

And I wanted to first start with Dr. Mason, and I appreciate you appearing today as the minority witness.

I want to take a minute to touch on a critical part of the laboratory workforce that may often be overlooked, and that is the construction and maintenance workers. And it is essential to have dedicated, trained maintenance workers who understand the chal-

lenges of a day-to-day work that is conducted at our national laboratories. And my question for you, Dr. Mason, is what you can tell me about what we can do to ensure that we are protecting these valuable employees and ensure that they are paid a prevailing wage and that laboratories are not going around Davis-Bacon requirements or using temporary workers to not have to comply with prevailing wage laws?

Dr. MASON. Well, you know, first, any construction project that we undertake is subject to Davis-Bacon, and so we go through the Davis-Bacon determination to determine what is covered work and then the covered work is subject to the prevailing wage requirement. So that is built into how we do construction projects.

In terms of the ongoing maintenance, which is not Davis-Bacon, I can speak to Oak Ridge. Maybe my colleague can speak to how things are at NREL. But about 15 percent of our workforce is the crafts, and they are represented by the Atomic Trades and Labor Council. We have a collective bargaining agreement with them. And in fact the wages that we pay are in fact probably slightly above the prevailing wage level that would apply if it were Davis-Bacon work, as in the case of a construction project.

And you are absolutely right. Every element of our workforce is critical to getting the job done. And I would note that, as I mentioned, in preparing to deal with budget constraints, we have been looking hard at our wages and our benefits, and in fact as all of the labs went through this period with the pay freeze that has been experienced in the Federal system, of course that did not apply to collective bargaining agreements but we were able to reach agreement with the ATLC where they undertook exactly the same austerity measures that applied to all of the other staff because of the recognition that it was important to protect jobs.

So I think we have a very strong relationship and all our employees are paid at rates that are market-competitive. That is actually one of the benefits of the GOCO model.

Mr. SWALWELL. Great. Thank you, Dr. Mason.

Also, for Dr. Arvizu, how are the national laboratories working with private industry? And what I mean is can you describe the process for a private company to begin working in an unclassified way with a national laboratory and what can we do to expedite this process to increase the technology transfer?

Dr. ARVIZU. So there are a number of mechanisms that we use and Dr. Mason has mentioned a few of those. The one that we use mostly is the Technical Services Agreement because they are very, very quick and they allow us to essentially put agreements in place in less than two weeks and essentially that is what we do.

They are—those are agreements that don't have intellectual property sorts of expectations and so that doesn't need to be negotiated necessarily.

The workhorse of our agreements though is the Cooperative Research and Development Agreement, and we have a number of those. The way industry comes in is they can come in under a number of different pathways. They can cost-share research with us. They can do a total funds and research opportunity. They can be part of a DOE solicitation program that ultimately ends up in a cooperative agreement. But we have standard agreements that can

be executed very quickly. We have others that if there needs to be tailored negotiation terms, it takes a bit longer. So it is in that method of trying to get to the most flexible items possible that there is opportunity for improvement.

Mr. SWALWELL. Great.

Dr. ARVIZU. And so the ACT is one of those.

Mr. SWALWELL. Thank you, Dr. Arvizu.

And, quickly, Mr. Stepp, one of the recommendations is that Congress allow the labs to charge a market rate, which I think is an interesting idea, but I am concerned that this could crowd out smaller, more innovative ideas that don't necessarily have funding behind them, users that don't have the funding behind them. And do you fear that unintended consequence or intended consequence? I hope not but——

Mr. STEPP. No, I don't think that is an unintended consequence. No, I don't necessarily fear. I think there is a concern—a larger concern that, say, smaller businesses are currently unable to work with the labs in a large way, and so I think what the—charging a market rate allows is actually provides an incentive for the labs to do more of this type of collaborative work with industry so they will have more of an opportunity to work with those smaller entities. I think there are other recommendations in the report and elsewhere that would actually help smaller entities work with the labs. I think that is not a one-size-fits-all. I think that—adding that market incentive broadens the ability of the labs to work with them, but there has to be complementary policies that go along with it to help the smaller entities.

Mr. SWALWELL. Great. Thank you, Chairman Lummis.

Chairman LUMMIS. I thank the Ranking Member and now yield to the gentleman from Illinois, who is always at these hearings. We so appreciate your valuable attendance. The Chair now recognizes Mr. Hultgren.

Mr. HULTGREN. Thank you, Madam Chair. Appreciate all you do as well. Thank you for doing this. Thank you all for being here. I do think this is a really important discussion and appreciate each of you, the work that you have done in different areas, specifically in the labs or even just helping us figure out the future of our laboratory system.

I love serving on the Science Committee. I am very proud of the new bipartisan National Science and Laboratories Caucus that is growing and active. I absolutely believe in our laboratories and am so proud of what is happening in our laboratories and I know what is going to happen in our laboratories.

So I think this is a very important discussion to be having of what does the future look like? And I agree with many of the conclusions that were set out in the study and—of giving some more flexibility, getting less micromanagement from top-down, making sure that we are protecting from pushing agendas through our labs but instead allowing labs to do research.

For me, it really goes back to a core fundamental belief that I have as a conservative is that government has to do what the private sector can't do, and whatever the private sector can do, we shouldn't do. And whenever—you know, there are balances there. Certainly, when it is technology transfer, that is where we struggle

and figure out what is that line that we should do and the labs should do and what should private sector do.

I don't think there is any question or not much question at least when it gets to basic scientific research. That is very difficult if not impossible to put together a business plan to sell to shareholders to do basic scientific research. And that is something we have to do. So one of my frustrations and I guess a challenge I would make as a follow-up to the study or kind of next steps of the study is really recognizing—I think we have wonderful lab system but also very diverse. You mentioned it a little bit in the study but I think we have to recognize that there are some labs that aren't positioned to provide tech transfer. There are some labs that absolutely are and should be kind of on the forefront of making the connection with private sector. There are others who are doing the work that our private sector can't do. And we need to keep doing that.

So that is something I want to ask you about specifically with laboratories. I am passionate about Fermilab that is in my district. I am open about that, but other laboratories as well. You know, I know Princeton Physics Lab, Thomas Jefferson National Accelerator Lab, these other laboratories also have a very specific mission that doesn't necessarily lend itself to tech transfer but does absolutely have a vital role of basic scientific research.

So just want to get your response on that of how you see that fitting of those very focused mission labs. How does that interact with your report, specifically Mr. Spencer and Mr. Stepp?

Mr. STEPP. I will start with that. I think that is a really great question. It is a key issue. It is one that we were very careful to address in the report. In fact, we didn't propose any reforms that were kind of a blanket approach, a one-size-fits-all. For—I will give you an example. We want to make technology transfer a bigger part of the annual evaluations of the labs but we were careful not to specifically say what the weights and how specifically that should be done because we recognize each of the labs are different.

So in fact we really hoped that DOE and individual labs would negotiate what those weights and so forth would be recognizing that labs like Fermi are going to do less technology transfer just inherent to the science than say an NREL would actually do. So I think that is a key question. I think that is built into some of the recommendations I would make.

Mr. SPENCER. Yes, that is a great question, and it is a concern that has been brought up by a number of folks. There is nothing in the report that prohibits funding for discrete projects. So the way we would look at this is we are going to continue to debate amongst us all what the—what should be funded through the labs, what we decide are core government missions. And these are the types of things that you are talking about. So there is nothing in the report that prohibits any of that or increases it.

What we are talking about is once we have a debate and you have that funding in place, there is other stuff. What are the mechanisms to better rationalize the lab infrastructure that is left over? What are the mechanisms that we can put in place that even on the basic science piece that we can help identify earlier on what might be market—interesting in the marketplace. So that is really where our recommendations focus on, not on that core function. So

all of those things that you are talking about will still be there, assuming you win the debates and the—you know, during the funding process.

Mr. HULTGREN. Yes. Well, that is the challenge and I want to be engaged in it. You know that. The people on the committee know this that this is important. And I will close with this—and you all know this as well. But one of my physicists, a lot of my constituents are much smarter than I am, which I am thankful for, but especially my physicist constituents. But one of them said something that there is really two kinds of science: Newtonian science and Edisonian science. The market is excellent at the Edisonian science of taking great ideas, new discoveries, and applying them to make our lives better and make a profit, a good thing for everybody. Newtonian science, the basic fundamentals of what makes something work, the market has a trouble doing that type of research.

And so I just want to make sure as we are going through this—and again, I will spend some more time going through the research and would love to sit down with you more directly on this and maybe even have something with the caucus or follow up with the Committee to talk further on that, but just to make sure again that if all else fails we are still doing the Newtonian science, the new discovery, the things that are going to inspire young people to want to join in and study STEM education.

And I think that is going to be a really important thing that I would also—and I am sorry I am going over, but real quickly, that STEM education is so important and our labs are a key part of STEM education. We need to be talking about that. Kids are smart in the 7th and 8th grade. They are going to see if we don't believe in science as a country, they are going to choose to go into law or finance or something else. We need to make sure that they see that there is an opportunity for them to do research and discovery right here in America and our labs are an important part for that to happen.

So thank you. Thank you for your generosity and time, and I yield back.

Chairman LUMMIS. The Chair just isn't going to interrupt that kind of passion and enthusiasm. Thank you very much, Mr. Hultgren.

The Chair now recognizes the gentlewoman from California, Ms. Lofgren.

Ms. LOFGREN. Well, thank you very much.

And it was wonderful to hear Mr. Hultgren's comments and it reminds me of the long-standing bipartisan support we have in the Congress for basic research. It is good that we reiterate that because, you know, we have had little dustups on other things, but if we continue to have that solid support across the political spectrum, I think our country's future will be much brighter and it was good to hear a reaffirmation of that.

I wanted to talk a little bit about—I realize that the focus really has been on Office of Science research, but looking at the report on page 40 and 41 on the NNSA, it seems to me—I mean over the years I have heard some concern expressed on Office of Science management, and I am sure that there can be improvements made.

But it pales compared to the criticism I have heard from—about NNSA management.

And as you point out on page 41 NNSA does have a national weapons focus, but they also fund science. And I think if we do not focus on the outrageous mismanagement at NNSA with the—most of the money is there, and tie in the reform effort because they have a huge role to play in science, as well as weapons security that we are going to miss a big bet.

Now, I realize Armed Services also has—Committee has some jurisdiction but we do, too, in terms of the science issue. And I am wondering, Mr. Stepp and Mr. Spencer, I realize that wasn't the focus of the report, but if you think that some of the recommendations made—well, I will just give you an example.

NNSA headquarters made a budget finding about Lawrence Livermore National Lab in terms of what they could yield on user fees that was completely made up. They never consulted with the lab. They never investigated whether there were any customers other than Russia or China, which for security reasons would be problematic, and they just put a number in there, which since it is—cannot be done, will result in the layoffs of hundreds of physicists at the lab, which will critically impact our ability to even run the Stockpile Stewardship Program. Do you have a comment on that?

Mr. STEPP. Sure, this received significant debate over the year-and-a-half we spent doing this project, and I will give you my personal opinion. There is not one recommendation in the report that I think shouldn't be applied to the NNSA labs. I think ultimately we decided that because Congress is taking a very unique and special look at NNSA and there is now a task force that came out of NDAA and what they are going to propose, that given all those complexities, we didn't want to get these recommendations wrapped up in those things, but we do make the comment in the report that ultimately spurring more technology transfer, more efficient management, all of those principles should be taken at NNSA and ultimately whether or not Congress decides to reform the NNSA management structure, give it back to DOE, do whatever it is, I think those principles hold for whatever the new structure is going to be.

And ultimately, my personal view is that at the end of the day all of the labs would be under unified leadership and we wouldn't have to split non-NNSA and NNSA labs up as we proposed. But I think we are happy to at least get 13 of the labs under one unified leadership——

Ms. LOFGREN. No, I understand.

Mr. STEPP. Right.

Ms. LOFGREN. Are there other witnesses who want to comment on that?

Dr. MASON. Well, certainly, you know, the NNSA labs do contribute a lot to both the science and the energy missions, and similarly, actually, you know, at my lab we do a lot of work in support of nonproliferation programs for NNSA. And in fact there is a very healthy interaction between some of the technologies developed.

Dr. MASON. And so as Mr. Stepp said, although in areas of national security, there are some things that you stay away from tech transfer because——

Ms. LOFGREN. Sure.

Dr. MASON. —you know, we call that espionage. There are a lot of innovations that have flowed out of the national security missions, just as was the case with GPS.

Dr. ARVIZU. And if I could add to that, having spent 20 years in a national security laboratory, there is great synergy between what the NNSA labs and the bulk of the national labs do. The value and strength of the national labs is in their cohesive interaction and we do a lot of work with Sandia as a consequence of that.

Ms. LOFGREN. Madam Chairman, I think this is such an important issue in its joint jurisdiction between our committee and Armed Services, and maybe we could discuss doing something with Armed Services to take a look at this because I think if we don't, the science mission gets lost in the shuffle and that would really impair our Nation's future. So I thank you for allowing me to ask these questions.

Chairman LUMMIS. I thank the gentlelady. The Chair now recognizes the gentleman from Illinois, Mr. Lipinski.

Mr. LIPINSKI. Thank you. I would like to start off by commending the authors for all the great work that went into preparing this report. The fact that the report is co-authored, as the Chairwoman said, is co-authored by experts from think tanks across the ideological spectrum as well as the ITIF is really a testament to the wide appeal that I think a lot of these recommendations are going to have, and I certainly think there are a lot of very appealing recommendations in there.

I am especially interested in the recommendations regarding technology transfer at the labs. I have long been a proponent of facilitating technology transfer from all federally funded scientific research which goes on at research universities and also the DOE national labs because they are a very important part of that. And I think we have in the past overlooked that. I think our labs do a wonderful job and I am not just saying that because Argonne National Lab is in my district, but we should always look for ways to make their work on technology transfer easier.

As I said, when the report came out, I intend to work with the authors to implement some of the recommendations in the report.

I want to start out and ask—talk about the ACT agreements. I know there has been some talk about that already, but I know that these agreements are intended to provide a flexible framework for negotiations of intellectual property rights to facilitate the technology transfer moving from the lab to the marketplace. Right now, it is a pilot program established last year by DOE and I understand only a few labs are able to enter into ACT agreements at present. So I wanted to hear from the panel both from Mr. Stepp and Mr. Spencer, also from the national lab perspective, from Dr. Mason and Arvizu, do you think that the ACT agreements could be utilized by all DOE labs through—to facilitate technology transfer? Let's start with Mr. Stepp.

Mr. STEPP. Absolutely, yes. I think ultimately as a group when we were discussing what our ideal collaborative agreement will

look like, ACT comes relatively close in terms of its flexibility, so I see no reason why all the labs can't use it.

Mr. SPENCER. Yes, I would just add to that that as that expands, however, we need to make sure we put a premium on transparency. That is going to be really important if what we recommend is implemented and we give a lot of flexibility to how these interactions take place. It is going to be really important that we are able to see from an oversight perspective exactly what is going on there, so we need to make sure we couple the additional flexibility with maximum transparency.

Mr. LIPINSKI. Thank you. Dr. Mason?

Dr. MASON. As you know, ACT is currently a pilot and that is partly because it is a new thing, and I think there are some labs who elected not to participate in the pilot not because it would be impossible for them to implement but just simply because they wanted to wait and see how it worked out. So my expectation is that if the initial feedback is positive in terms of fundamentally faster time to agreement, and that is really what ACT is about, then that will encourage some of the labs who haven't participated in the pilot to join in.

You know, in the end, the way that ACT works is it allows the contractor who operates the lab to serve as a buffer essentially between what looks like a more normal business-to-business agreement and the requirements of dealing with the Federal Government. And so the contractor managing the lab has to be willing to serve as that buffer. That involves shouldering some risk and so I think that is why in some cases some of the labs have chosen to sort of wait and watch and see how the pilot goes.

Dr. ARVIZU. And I agree certainly with what has been said. In addition, I think it is another tool in the toolbox. I think the more tools we have, the flexibility we have, the better it is. Even in the pilot there are some provisions that probably need to be revisited, one of which is that we cannot do an ACT agreement with an entity that is receiving government funding. And so we need to do something to relieve that constraint because that really eliminates a great deal of companies, Small businesses that have an SBIR (Small Business Innovation Research) report—have an SBIR grant, for instance, cannot participate in the ACT. It eliminates that as a particular tool for that group of companies and entities.

So there are ways to improve it but overall I think there is no reason why this can be expanded to all the national labs.

Mr. LIPINSKI. Thank you. Mr. Spencer?

Mr. SPENCER. It is worth mentioning that we addressed some of those—that thing specifically in the report, and it is also—I would like to just throw out there that, you know, we think it is really important to introduce that those market as well in terms of fee bonuses and setting prices and that sort of thing to help facilitate these sorts of interactions.

Mr. LIPINSKI. Thank you. I would just throw out and put in a question for the record asking about increasing the importance of the weights put on technology transfer in the report cards for DOE labs. But I know my time is expired, so I yield back.

Chairman LUMMIS. Thank you, Mr. Lipinski. We do have time for a lightning round, and since there is interest among members

of the committee, we will do that now. Each Member will have three minutes, so if the clerks will set the clocks for three minutes, I will begin.

And in my first question is a segue from Mr. Lipinski's questions. Can you tell us how the ACT model is—gives you more flexibility or is a little different from CRADAs and other models that you have used in the past?

Dr. MASON. In a Work for Others agreement, which ACT is fundamentally an alternative to, there are a number of provisions that are required because even though the labs are operated by contractors, they are government labs. And so one, for example, is that essentially the government always has to be in a zero-risk position financially so that if there was a cost overrun on a privately funded project and you did not have funds in hand to cover it, that would be an anti-deficiency, which is obviously not a good thing. Someone can go to jail and so forth. So we require payments in advance, 90-day payments in advance. We cannot provide any performance guarantees.

So the contract that we would propose to a private sector entity is: pay us in advance, we will do the best we can, and if we can't get it done, you are out of luck. It doesn't resemble what looks like a normal business contract where you might guarantee a price and a deliverable. ACT allows us to sign that kind of contract because the contractor will shoulder that risk. So the government is still protected. There will be no anti-deficiency. If it takes longer, if it costs more, the contractor will shoulder that burden.

In return, the contractor is allowed to charge an increment on the cost of the work to cover that risk, and that gets to the incentive that Mr. Spencer recognized. So the contractor will have an incentive to go into those sorts of contracts but the government will always be held harmless. The hope is that allows us to reach agreement quicker because private sector companies will look at a contract that looks like it has a deliverable, it has a price, and then we have more flexibility in IP as well.

Chairman LUMMIS. They just called votes in a complete surprise to us. So I am going to give it—but we do have time for each Member to ask one question. So I will yield the questioning to Mr. Swalwell.

Mr. SWALWELL. Great. Thank you, Chairman Lummis.

Dr. Mason, other government agencies, universities, industrial laboratories are regulated under OSHA as far as workplace health and safety conditions, and DOE is unique and maintaining its own environmental safety and health infrastructure for its national laboratories. Do you believe that the safety and productivity of DOE's national laboratories may be better served by shifting and moving the labs to OSHA regulation rather than regulation by the Department itself, and if so, why?

Dr. MASON. This is actually a topic that the National Lab Directors Council has looked at in the past, and we have recommended that this should be something the Department seriously consider because we do believe there is an opportunity for cost savings. And I think that the thing that one needs to be very clear on is we are absolutely committed to world-class safety performance in our institutions. So we are not talking about backing away from safety

or watering down requirements. It is really a question of what is the most cost-effective way to achieve that safe workplace.

And, you know, if you look at many of the safest places to work in America today, our top-performing companies that are regulated by OSHA, I believe there is no reason that we can't achieve that same thing just as we do now in the current self-regulated environment that DOE operates.

Mr. SWALWELL. Great. Thank you, Dr. Mason. Thank you.

Dr. ARVIZU. May I ask at a little preamble to that or postamble to that, we have looked at that problem before is that OSHA will not take on that responsibility without the facilities of the DOE being in compliance with their requirements. And when it was examined last time, it was over $100 million of investments required in order to get into compliance so that could actually happen. So we need to be cognizant of the fact that that is a barrier to actually implementing that particular type of a structure, which I agree with. It is just hard to do unless we have the infrastructure investments required to bring our facilities up to compliance conditions.

Mr. SWALWELL. Thank you.

Chairman LUMMIS. Thank you. And Mr. Hultgren?

Mr. HULTGREN. Thank you. Real quickly, I know Secretary Moniz had sent a letter to the Chairman and Ranking Member and in the letter had referenced the national laboratory directors identifying 20 specific areas for improvement. Department—it went on to say that the Department had taken action on 14 of those, action still pending on two, agreement to defer for four remaining items. I wonder if you could talk briefly about that or if you could kind of get us some information specifically on those 20 areas. I know I haven't seen those. I am not sure if other Members have seen those. So I wonder if you can comment on that and maybe also follow-up in writing for us of some specific areas of improvement that have been identified by lab directors.

Dr. MASON. Yes, we will be happy to provide that information.

Just a very quick comment, this came out of an exercise that we called the Burdensome Policies White Paper that we did a couple years ago at the request of Secretary Chu. I think he was a little bit tired of lab directors coming in and complaining that it was too hard and too expensive to get our jobs done. And he said, "I need specifics. I need specific examples of things that I can work on." And so, as a group, we collected ideas and synthesized them into this burdensome policies document, which we will share with the Committee. And DOE has begun working on those and in fact—you know, not in the government transformation or changing things, but many of the reasons that we feel frustrated in terms of effectiveness and cost are not because of big things. It is a layering over decades of a whole bunch of small things and we have got to work them away. So we will provide that to you.

Mr. HULTGREN. Thank you. I yield back.

Chairman LUMMIS. I think the idea of a burdensome practices memo would be good for our leadership as well. I—Mr. Lipinski.

Mr. LIPINSKI. Thank you. I will get back to what I had—was talking about at the end of my first round there. I will just briefly say right now technology transfer activities usually account for about—for less than five percent of the overall grade for a lab on

report card, and—but the report advocates raising the priority of technology transfers to the same level of importance as other items like business systems and laboratory leadership. So I just wanted to ask Dr. Arvizu and Dr. Mason about the report's recommendations about raising the weight that technology transfer is given on these lab report cards, what your thoughts are on that. Dr. Arvizu?

Dr. ARVIZU. Yes, so the first thing I would say is that not all labs are the same and Dr. Mason can talk about the Office of Science labs. Certainly in the case of NREL, we have had as a—essentially one of the major elements of our Performance Evaluation Management Plan a topic called Accelerating Commercialization and Increasing Deployment. So it started off three years ago. It was 25 percent of our grade. Last year, it was ten percent of our grade. This year, it is 15 percent of our grade, so it is kind of moving around a little bit, but there is actually a line that does that. I think it really depends on the mission of the specific grading entity. In our case it is EERE. This is what they care about and it is part of our grade, but it is not true and uniform across the other labs.

Dr. MASON. Yes, I think it does—and I think it is noted in the report—need to be varied depending on the nature of the mission and the lab, but I think overall the reality is that if you place a high priority on something, that is what will happen. And in many cases I think there would be an advantage to elevating the priority.

Recognizing that it is not just about licensing agreement, there are many different ways we can interact with industry through our user facilities and even in the fundamental science labs like Fermilab, you know, picking up on the remarks from Representative Hultgren. You know, there are things that Fermilab has done to support the development of proton therapy for cancer therapy that have a tremendous impact, it may not take the form of a licensing agreement with industry but there are now proton therapy centers being built around the country modeled on Loma Linda. There was a key role that Fermilab played in putting it together.

So there are many different ways to measure it, but I think if you do elevate the priority, it will get more focus at the labs.

Mr. LIPINSKI. Thank you. And I want to thank the Chair for holding this hearing. I think it is very important that we look at this report and follow up also on some of the recommendations. So thank you.

Chairman LUMMIS. I thank every member of this committee and our staff. I thank our witnesses.

It is really encouraging that the same week of Secretary Moniz's announcement the think tanks released a report entitled "Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy," particularly encouraging because you put out a 70-page detailed report. It is a reminder that we can do things on a bipartisan basis where we see opportunities for policy improvement. The report included a bevy of bold recommendations including enhanced technology transfer, reducing micromanagement and bureaucracy, changing the DOE organizational structure and fundamental relationships with the national labs. Since collectively they manage more than $10 billion worth of scientific and national security, it is important that we give thoughtful consideration to these issues.

We recognize that the labs sponsor cutting-edge basic research and manage world-class user facilities. And it is a driving force behind the U.S. global scientific leadership and economic competitiveness. So we are looking very forward to continuing these discussions. We thank Secretary Moniz for his response to our letter so promptly. We are delighted with the work you have been doing to advance a more robust scientific exploratory environment in a way that unleashes the American competitiveness.

I thank the witnesses for their valuable testimony and the members for their questions. The members of the committee may have additional questions for you, and we will ask you to respond to those in writing. The record will remain open for two weeks for additional comments and written questions from the members.

Again, with our considerable thanks, the witnesses are excused and this hearing is adjourned.

[Whereupon, at 11:05 a.m., the Subcommittee was adjourned.]

Appendix I

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mr. Matthew Stepp and Mr. Jack Spencer

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
Subcommittee on Energy

Oversight and Management of Department of Energy National Laboratories and Science Activities

By
Matthew Stepp
and Jack Spencer
Senior Policy Analyst, Information Technology and Innovation Foundation

Hearing Question Responses for the Record
The Honorable Cynthia Lummis

1. **A report issued earlier this year by the National Academy of Public Administration recommended that Congress direct the Secretary of Energy to engage an external commission for two years to perform an assessment of the strategic future of the national labs. This review would focus on whether DOE is sufficiently integrating the labs' capabilities and optimizing their value to the Nation. Would such a review be useful and why?**

Response: An external review of the strategic future of the National Laboratories would be useful, in particular because government agencies other than DOE are increasingly becoming significant collaborators and funders of lab research. A larger stakeholder discussion is certainly needed – and I'd argue required – to ensure the labs are providing *national* capabilities for all of its partners.

In fact, the National Academy of Public Administration (NAPA) recommendation does not go far enough; the commission should be a permanent body or cross-agency working group that includes the relevant agency partners and stewards. For instance, an important DOE representative of the commission would be the new Under Secretary for Science and Energy (or Science and Technology, as described in the *Turning the Page* joint report), so that his or her strategic planning of the 13 labs also reflects and recognizes the labs other partners. Research and capability integration is important, but only if it is an enduring part of lab stewardship.

I would also amend the NAPA recommendation to explicitly state that the commission is relevant to both DOE *and Congress*. The current integration and strategy underlying the labs reflects the mix of government agency (through Congressional appropriations), industry, and academic funding priorities. Any new strategy for the lab system – regardless of who proposes it - potentially requires changing the way funding partners support the labs, including Congress. For example, *Turning the Page* proposes a lab strategy that includes lab research funded by science and technology outcomes rather than by today's existing stovepipe

system. This requires DOE institutional reform *as well as* Congress altering the budget line-items it traditionally utilizes to fund lab research.

2. **The report identifies long-term strategic goals as an area that needs to be addressed. It further recommends that the new Under Secretary for Science and Technology develop a strategic plan encompassing 13 different labs for both a 5- and 10-year period.**

    a. **How would the labs be held accountable to these goals?**

Response: The labs would be held accountable for 5- and 10-year strategic goals through the expanded Performance Evaluation and Management Plan (PEMP) and Congressional oversight of DOE-sponsored research. The Under Secretary's strategic plan would be implemented through the character and type of research and infrastructure investments made at the labs. The performance and impact of these investments as it pertains to the overall strategic plan would be assessed in the annual PEMP review. Additionally, Congress already provides necessary and important oversight of DOE research appropriations, thus allowing for two levels of accountability.

    b. **What monitoring and verification mechanisms are necessary to track contractor performance between the window of strategic planning and re-bidding operational contracts with DOE?**

Response: The annual PEMP process should be the chief method of monitoring and verification of contractor performance. Ensuring this requires DOE reforms. For instance, *Turning the Page* recommend that DOE expand the PEMP – in negotiation with lab contractors – to explicitly reflect increased contractor accountability and mission goals spelled out in the DOE/Under Secretary strategic plan, including technology transfer.

This is a cornerstone recommendation because the chief method of monitoring and verification utilized today is through DOE headquarter/site office oversight of day-to-day decision-making. Such a heavy-handed method of oversight is unnecessary and can stifle innovative ways of meeting DOE's strategic plan. The PEMP offers a straightforward alternative and should play an increasingly important role in the lab re-bidding process.

3. **According to the joint report, user facilities and research capabilities that aren't in high demand should be shut down as long as doing so is not in opposition to the national interest.**

    a. **How would this work as a practical matter? For example, how should a user facility that advances a clear national need or Departmental mission, but which is underutilized due to budget constraints or lack of industry interest, be handled?**

Response: In practice, shutting down low-demand facilities is a bottom-up process that should reflect the needs and advancement of the university and industry community as well as the DOE's strategic plan. For instance, shutting down a capability may be necessary because a next-generation capability has come on line, requiring staff and funding to shift. Such a shift would be done after significant stakeholder discussions with academic and industry partners and would be reflected in DOE's strategic plan. As a result, Congress would be well informed of these shifts in capabilities due to required changes in appropriations. A similar process could arise if the capability has fulfilled its mission or is being transferred to an academic or industry partner. It should be noted that current User Facility capabilities are already at or exceed capacity, which reflects the careful interaction of lab researchers, management, and User Facility clients.

Areas of research where this may not play out in practice are capabilities important to national security, in which case DOE, the labs, and Congress may want to continue support in lieu of academic and industry support.

b. And aren't there cases where industry interest and financial support may be limited, but the broad spillover effects of such research are clear? For example very fundamental materials science or chemistry studies that are ultimately applied by industry, but for which direct demand for facility time may be small?

Response: Yes, in cases of basic science, industry interest may be small, but typically academic (i.e. university) interest is high. Therefore, measuring the overall demand of lab capabilities should reflect both industry *and* academic interests and support.

4. There are certain labs that are almost exclusively single-purpose labs, such as Fermilab, Princeton Physics Lab (fusion), and Thomas Jefferson National Acceleratory Lab (nuclear physics). How would the report's proposals affect those labs?

Response: The proposals would not affect single-purpose lab research in any way. The report explicitly recommends that lab-wide reforms, such as increasing the weight of technology transfer in annual lab evaluations, be implemented flexibly so that labs' fundamental missions are not negatively impacted. Similarly, recommendations that propose allowing labs to charge flexible pricing for collaborative industry use of lab capabilities explicitly does not impact non-proprietary government and academic research, which would continue to take priority over industry research.

The recommendations do assume that single-purpose labs are also part of the proposed shift to a stronger contractor accountability model. In this case, single-purpose lab management processes may change to reflect these reforms, but this

would not negatively impact research.

5. **Do you support making basic components of agreements, between labs and industry users, such as Work for Others, Cooperative Research and Development Agreements, and Agreements for Commercializing Technology, available to the public?**

Response: I support making components of lab-industry agreements public only if public scrutiny does not negatively impact the industry partner's competitive standing. Data that should not be made public includes: information regarding the company's research goals, market analysis, and any proprietary information required to scope its collaboration with the labs or its research. In the case of Agreements for Commercializing Technology (ACT), this could also include lab contractors that are taking on financial risk for working with an industry partner.

Otherwise, making non-proprietary portions of the agreements public would allow for the dissemination of best practices to other labs and potential partners. This is particularly important for the labs gaining institutional experience with the new ACT agreements for which many labs have no negotiating or contractual experience with.

In addition, public dissemination could lead to labs implementing more homogenous lab-industry agreements. As it stands today, each lab utilizes its own interpretation of each agreement, but if industry and academic users have access to agreement information, it would encourage the labs to offer standardized contracts.

6. **While increasing operational lab flexibility is an important step to increase effectiveness of the labs, it is important for Congress and the Department of Energy to hold labs accountable for delivering results. How can this balance best be reached? For example, how often would the Performance and Evaluation Management Plan (PEMP) be rebid?**

Response: Lab contractors typically sign 5-year contracts with the opportunity to renew. Therefore, changing accountability expectations through the PEMP should not be done in such a way that fundamentally alters the accountability and expectations outlined in the Management and Operating contract, unless previously agreed to by both parties. This assumes a baseline period of re-working the PEMP every 5-years, in line with contractors re-competing or renewing their M&O contracts.

Of course, changes to the PEMP may be necessary in the interstitial period between re-bids, in particular in the early years of implementing a stronger contractor accountability model. In this case, DOE should have the flexibility to change the PEMP more often with one caveat: the scope of changing the PEMP should be negotiated with the lab contractors so that the contractors understand and can plan for accountability expectations. In the extreme, I do not recommend a situation

where DOE dramatically alters the PEMP in mid-contract without providing lab contractors the ability to plan for meeting new expectations the following year. Therefore, DOE should make smaller changes to the PEMP on an annual basis if it doesn't fundamentally change the expectations set through the existing M&O contract. More significant changes may require negotiation.

Hearing Question Responses for the Record
The Honorable Marc Veasey

1. **It seems the vast majority of federally licensed patents developed in our national labs never make it to market. What do you attribute that to, and what role do you see the private sector playing in helping to commercialize federally licensed patents?**

Response: I believe the private sector should play a central role in commercializing federally-licensed patents. *Turning the Page* recommends a series of reforms to more easily transfer lab developed research and technology to industry, which can then focus on moving new products to market.. With that said, I believe it is often the role of the labs (and federal funding) to move science and research close enough to commercialization so that industry efforts will be more successful, otherwise known as research or technology maturation. This *does not include product development,* but does include additional research and development, additional research to address a new problem, developing research or ideas to the proof-of-concept stage, or demonstrating an idea to remove research barriers only relevant to a technology at greater scale.

Second, I attribute lab research not meeting its market penetration potential to five issues:

- Lab managers have weak incentives to collaborate with industry because the labs can only charge cost for allowing industry to use research capabilities, therefore providing no market rationale for interacting with industry anymore or less. In addition, technology transfer is a very small metric used in the labs annual evaluation.

- The labs are provided little financial support to develop research to a point that reduces risk or presents an opportunity for industry to license the technology and take it to market. Lab research funds are restricted to meeting the agreed upon research goals provided by Congress, the DOE, and DOE program managers. If additional research and development is necessary to advance an idea to a position with commercial potential – such as proof-of-concept or demonstration scale - the labs have little recourse. The labs can hope that industry assumes higher risk than normal and licenses the research, which typically does not occur, or Congress and DOE can provide additional research funds to ensure that the research reaches this stage,

which also happens only rarely. More flexible methods to support research maturation, such as Lab-Directed Research and Development funds, are restricted from being used to advance research and technologies. Previous Congressional authorizations to create maturation funds for DOE have not been appropriated or have been eliminated.

- Large companies find it difficult to work with the labs, thus limiting the number of opportunities available to move research and technology into the private sector. In these cases, collaborating with the labs requires complex agreements often with long negotiation and approval periods or contractual constraints that industry is unwilling or unable to agree to. For instance, there are five different lab-industry agreements, interpreted differently across 17 labs, resulting in at least 68 ways agreements can be interpreted. In addition, these agreements must be approved by lab managers, the site office, and in many cases DOE headquarters creating an extensive list of approvals. There is simply no easy access point for industry to work with the labs quickly.

- Small companies and start-ups – those we would expect to collaborate most with the labs – are limited by the same complexities described above as well as the labs charging a high contracting cost. Small businesses simply don't have the funds to afford to work with the labs even if it were crucial to developing a new technology or accelerating their move to the market.

- Inconsistent conflict-of-interest laws limit lab researchers ability to take leave of absence to create a start-up company, both while working at the lab or offering the opportunity to return to the lab.

Responses by Mr. Jack Spencer

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
Subcommittee on Energy

Oversight and Management of Department of Energy National Laboratories and Science Activities

By Jack Spencer
Director, Roe Institute for Economic Policy Studies
The Heritage Foundation

Hearing Question Response for the Record

The Honorable Marc Veasey

1. It seems the vast majority of federally licensed patents developed in our national labs never make it to market. What do you attribute that to, and what role do you see the private sector playing in helping to commercialize federally licensed patents?

There are several reasons federally licensed patents developed in our national labs never make it to the market place, which are detailed in the recent report, *Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy*, produced by the Information Technology and Innovation Foundation, Center for American Progress, and The Heritage Foundation. The ones I would like to discuss are:

- Market detachment
- Lack of flexibility
- Weak incentive structure
- Competitive marketplace that already exists

Market detachment. Too often, politicians attempt to identify what should be commercially viable and then build taxpayer funded programs to achieve their vision. This generally results in government programs with goals of producing a commercially viable technology within an arbitrary given amount of time. But this is a backwards approach to innovation which, rather than encouraging innovation, channels it into politically expedient projects and technologies. This model does not work and represents a complete rejection of the free market.

In essence, it injects politics and political timelines squarely into a process of research, discovery, development and commercialization that should remain solely the private sector's jurisdiction. In a world of limited resources, the capital to finance new research and development projects is not endless. When Washington decides that it wants something that the market is not producing, it must extract some of these limited resources from the private economy and redirect them to the government program, socializing the costs and privatizing the benefits. Sometimes this might be to meet a national need, like defense. Other times this might be to meet a political desire, like to build a wind power industry. In neither case is the federal government spending on something that the market wants, thus it stands to reason that the vast majority of patents produced under such circumstances would never result in commercially viable products.

This is not to suggest that government funded research never results in commercially viable products. We know that to be false as GPS, commercial nuclear power, and the Internet all demonstrate. But the government has little, if any, ability to identify unmet demands in the market and to invest in a research program to produce products to meet that demand. Instead, during the course of conducting research toward a non-commercial end to meet a specific government need, the government may produce something that has a commercial application. When this occurs, as it did with the examples above, the nation needs a flexible system that allows those ideas, patents, or inventions to easily transition out of the government lab and into the marketplace. Identifying those success stories will be a far better measure of the impact of government research in the market than how many government licensed patents actually lead to commercial viable products.

Lack of flexibility. The private sector should play the predominant role in commercializing federally licensed patents that show some market promise. A system that allows the private sector to reach into the labs to pull out commercially promising research would do that. But there may also be times when lab researchers identify an opportunity that could meet a market demand. The system should be adequately flexible to allow for that as well. This is why we believe that Congress and the administration should execute consistent guidelines on conflict of interest laws to recognize openings for entrepreneurial leave.

Weak incentive structure. Creating a system that increases access to government research will invite the private sector to identify promising federally licensed patents for commercialization. The increased bureaucracy of the labs over time has created a disincentive for private companies to reach into laboratory research and bring those patents to the market place. This is why we believe we should unify lab stewardship, funding, and management stovepipes. By creating a new Undersecretary of Science and creating broader program offices, activities in the lab will be better coordinated across the research spectrum. Over time, this will create a culture change that will invite more companies to identify the promising patents and create innovative products. In turn, implementing market-based reforms that create market prices for user facilities will invite private companies into the labs. Companies will become more engaged with the labs and identify federally licensed patents that they otherwise may not have known existed.

The market already works. The reality is that when it comes to energy, the free market works. Indeed, the business environment for energy is robust despite seemingly endless forays by policymakers and bureaucrats into the energy industry. We have a diverse, competitive energy market and a high demand both domestically and globally for energy. Ideas succeed and fail all the time. Whether in the Department of Energy or in the broader economy, patented technology will sometimes succeed and sometimes fail. The solution, then, is not more or "smarter" government programs to advance certain areas of technology. Congress and the Department of Energy should avoid increased attempts for the federal government to drive that commercialization and instead implement reforms that will help minimize the barriers that prevent opportunities for the private sector to commercialize research from federally licensed labs, as detailed further in in *Reimagining the Labs*. Even activities such as building demonstration-scale plants should be avoided and in fact, reduced. The private sector should take the risk and reap the rewards or suffer the losses from bringing patents to the market place. The more the federal government involves itself in that process, the more private companies will rely on taxpayer-funded dollars to take the risk and the critical mechanism that truly drives innovation, risk and reward, is significantly diminished.

Responses by Dr. Thom Mason

Answers to Questions on Oversight and Management of Department of Energy National Laboratories and Science Activities

Thomas E. Mason
Director, Oak Ridge National Laboratory

Answers to Questions from the Honorable Cynthia Lummis

1. **What is your reaction to the recommendation of scaling back site office operations by providing more autonomy to lab contractors? What would this transition look like, and what steps or milestones would need to be in place along the way?**

I believe that providing more autonomy to lab contractors would increase the ability of the laboratories to deliver on their mission assignments. The extent to which this could influence the scale of U.S. Department of Energy (DOE) site office operations will depend critically on each contractor's ability to provide DOE with the necessary assurances that the contractor is serving as a responsible steward of the public resources entrusted to it. Robust and reliable contractor assurance systems will be essential, and only when those systems are in place and validated through actual performance will it be possible to make an effective case for scaling back site office operations. The authors of "Turning the Page" point out that DOE must take into account the heterogeneity of its national laboratories in streamlining the site offices. Therefore, it is difficult to generalize about the steps or milestones that must be in place to move toward greater autonomy for lab contractors.

The authors also call for negotiation of staffing levels in DOE site offices as new contractor accountability models are implemented in contract renewals or new bids. Certainly renewals and contract competitions provide a good opportunity for DOE to evaluate contractor performance and determine appropriate levels of oversight, but requiring DOE to negotiate with contractors is likely to lead to charges that the fox is being allowed to decide how to run the henhouse. A more effective mechanism is proposed in the 2002 DOE Best Practices Pilot Study (Lawrence Berkeley National Laboratory report LBNL/PUB-865, available at www.lbl.gov/Ops/assets/docs/best_practices.pdf): "Contractually specifying the roles and responsibilities, performance expectations, and behaviors of both the contractor and the federal sponsor provides a strong foundation to create the kind of relationship needed to increase accountability, cost-effectiveness, and performance."

2. **A report issued earlier this year by the National Academies of Public Administration recommended that Congress direct the Secretary of Energy to engage an external commission for two years to perform an assessment of the strategic future of the national labs. This review would focus on whether DOE is sufficiently integrating the labs' capabilities and optimizing their value to the Nation. Would such a review be useful and why?**

The strategic future of the national labs has been studied extensively by a number of National Academy panels and other bodies. These studies, and other recommendations in the NAPA

report, offer many useful suggestions for integrating the capabilities of the national labs. Secretary Moniz has already acted on some of those suggestions in launching a major realignment of DOE's management structure, In addition, Congress has created an advisory panel on the governance of the nuclear security enterprise that is looking at the National Nuclear Security Administration (NNSA) laboratories, and the Senate's FY 2014 Energy and Water Appropriations bill establishes an independent commission to review the effectiveness of the national energy laboratories. Rather than standing up another review at this time, I think it would be more useful for DOE and the national labs to act on some of the excellent advice that has already been provided to us.

3. **The report notes that labs conduct significant research through Work For Others (WFO) programs, and that these programs vary contract by contract and across agencies. How much of the work at your lab is done through WFO programs and how widely do the terms differ across projects?**

All WFO (federal and nonfederal) is performed on a full cost recovery basis, under terms specified by DOE Order 481.1C and DOE Order 522.1, which governs pricing of materials and services. A 3% Federal Administrative Charge (FAC) is applied to WFO projects to defray the cost of management and oversight. The FAC does not apply to projects sponsored by the U.S. Department of Homeland Security (DHS) because DHS, by law (the Homeland Security Act of 2002), has special access to the national labs; essentially, work for DHS is on an equal footing with DOE missions.

At Oak Ridge National Laboratory (ORNL), WFO has historically represented between 15% and 25% of our operating budget; in FY 2013, it is about 16%, including work for DHS. Terms across projects vary only in the exemption of DHS work from the FAC.

4. **Your testimony endorses expanded use of DOE's new "Agreements for Commercializing Technology," or ACT mechanism, noting that it makes it easier for private companies to partner with national labs. Approximately how many WFO, CRADA, and ACT agreements is ORNL a partner to? In the interest of greater transparency, would you support making the basic information related to these agreements publicly available? Related to this, and given the labs' increasing flexibility in negotiating their own licensing agreements with industry, should the basics of such IP agreements be made public?**

ORNL currently has 276 active WFO agreements and 43 active CRADAs. ACT is a new mechanism currently operating as a pilot program. ORNL was authorized to use the ACT contracting mechanism on February 20, 2013, but has not yet entered into an ACT agreement, although we are in discussions regarding several potential ACT agreements.

We certainly have no objection to making some information about partnership agreements publicly available, and in fact we often prepare press releases to highlight CRADAs, license agreements, and other technology transfer achievements. Naturally, proprietary information must continue to receive the appropriate protection, and some of our partners may have additional requirements for information protection that must be met.

5. Your testimony references a quote from 1985 that states, "In general, the process of commercializing intellectual property is very complex, highly risky, takes a long time, costs much more than you think it will, and usually fails." How would increased flexibility permit some labs to pursue this path while preserving an appropriate government role and minimize risk to taxpayers?

In commenting on the difficulty of commercializing intellectual property, my intention was to emphasize the need for any new technology transfer metrics to take into account the high failure rate that attends all technology ventures. If such failures result in lower performance ratings for laboratories, then it seems likely that few laboratories will be willing to accept the risk of failure.

I do believe, as I stated at the hearing, that placing more weight on technology transfer in the performance plans of those laboratories with research activities amenable to commercialization will increase the priority placed on this area, and I think that this would be a positive step. DOE's new ACT mechanism allows contractors to shoulder some risk while protecting the government (and the taxpayers) from any financial exposure. If the ACT pilot is successful, as I expect it to be, then this mechanism will give contractors the flexibility that they need to work with private-sector entities and reach mutually agreeable terms that appropriately address the risks associated with commercialization.

One barrier to increased commercialization is the limited access to funds for technology maturation. At present the only source of funds for this activity, which is key to reducing technological risk, is licensing revenue. Having access to either a small amount of programmatic R&D funds or an indirect budget allocation managed at the laboratory level, similar to the Laboratory Directed Research and Development (LDRD) program authorized by DOE Order 413.2B, could increase the likelihood of commercial adoption of laboratory-developed technology. Because the DOE order requires that LDRD be focused on early-stage research, LDRD funds cannot be used to fund technology maturation.

6. The report calls for eliminating the current 8% cap on Laboratory Directed Research and Development (LDRD) funding—flexible resources that labs can direct to projects of their choosing. However, the total LDRD across the labs was just 4.76%. The highest labs were Los Alamos (6.93%) and Sandia (6.69%). It appears the labs are not hitting the 8% cap.

Please describe how your lab utilizes LDRD funding. Is there a risk that eliminating the cap might result in "laboratory drift" away from Departmental-driven prioritization of science?

The current 8% cap is not an issue for ORNL since our LDRD program is less than 4% of the overall budget. As you noted, this is generally the case across the DOE system since funds are drawn from overhead budgets, which must support a number of other key functions.

ORNL uses LDRD funding to maintain the vitality of the Laboratory, enhance its ability to address future DOE missions, and stimulate exploration at the forefront of science and tech-

nology. Our program has four components: the Director's R&D Fund, which develops new capabilities in support of ORNL's research initiatives; the Seed Money Fund, which is open to all innovative ideas with the potential for enhancing our core scientific and technical disciplines; and two postdoctoral fellowship programs that support outstanding early-career scientists and engineers in establishing research programs in mission-related fields. The LDRD program is exceptionally productive; in FY 2013 to date, Director's R&D Fund projects at ORNL, which are funded at the level of less than 3% of the overall lab budget, are the source of 13% of our invention disclosures.

While the 8% cap is not an issue for any of the labs, there are concerns for the NNSA labs, where LDRD plays a somewhat different role, about moves to reduce the cap. Of greater value than increasing the cap would be to allow flexibility in the use of these funds or an alternate overhead mechanism to support technology maturation, as noted in the answer to the preceding question.

Answer to Question from the Honorable Marc Veasey

1. It seems the vast majority of federally licensed patents developed in our national labs never make it to market. What do you attribute that to, and what role do you see the private sector playing in helping to commercialize federally licensed patents?

As a 2009 U.S. Government Accountability Office (GAO) report on DOE technology transfer (GAO-09-548) puts it, "because the pathway from laboratory bench to commercial product is complex, involving numerous and sometimes difficult steps, the process can derail at any point and products may not always reach, or find success in, the marketplace." This statement holds true beyond the national labs; as a point of reference, the FY 2011 survey of U.S. university licensing activity conducted by the Association of University Technology Managers (AUTM) reports a total of 38,600 active licenses and options, with 591 commercial products introduced.

It can also be difficult to track the downstream impact of innovations. The same GAO report notes that while technology licenses generally provide for national labs to receive information about the commercialization of licensed technologies, the labs are not always privy to the results of other technology transfer agreements. For example, companies that perform proprietary research at DOE user facilities are not required to make public the results of their work, nor are they required to report on the commercial success of any patentable technologies resulting from their research. In addition, because much of the work at national labs is early-stage research and development (R&D), years may pass before a licensed patent results in a commercial product. In addition, if a patent is abandoned (as is our practice at ORNL for patents that have not been licensed after 8 years), the invention becomes available to everyone.

To provide some context, since the beginning of FY03, ORNL has been granted 556 patents. About 30% of those patents are currently licensed and being commercialized through 94 patent licenses. Because patents may be granted on the results of fundamental research performed without a specific commercial outcome in mind, a 30% adoption rate seems reasonable.

However, licensing is only the first step in bringing a product to market. The licensee must often raise money, develop a product, and successfully penetrate the market. Many of ORNL's licensees are start-up companies, and by some measures 75% of new high-technology ventures fail. Often the most important factor in whether an innovation from a national laboratory results in market impact is the survival of the licensing company.

Another significant barrier to commercialization is limited funding for technology maturation, the process of bringing technologies from the nascent stage typically reached at the end of the research funding cycle to the degree of demonstration and validation typically required for commercial adoption. As I mentioned in my testimony and in answer to questions from Chairman Lummis, providing programmatic funds or an indirect budget mechanism for this purpose would be helpful in moving innovations to market.

Particularly given these challenges, my view is that the private sector has a critically important role to play in the commercialization of innovations resulting from federally funded research. Collaborating with the national laboratories through CRADAs, WFO agreements, ACT, and

other mechanisms provides private-sector partners with the opportunity to see and understand the technologies available at the labs, and to influence the direction of the research. National lab scientists also benefit from interacting with their colleagues in the private sector.

In the past few years, DOE and its national laboratories have moved aggressively to strengthen the engagement of the private sector in technology development and deployment by creating and implementing new models for R&D that rely heavily on industry partners (e.g., Energy Innovation Hubs), developing more flexible partnering arrangements (e.g., the ACT mechanism), and developing new communication tools (e.g., the Energy Innovation Portal at http://techportal.eere.energy.gov, a one-stop resource for information on technologies available for licensing). The Department is also making unlicensed patents available to startup companies at a reduced price through its America's Next Top Energy Innovator program.

Finally, strong linkages between national lab innovators, private-sector investors, and other key players in the commercialization process are essential in helping new technologies bridge the "valley of death." At ORNL, we annually engage a small group of investors and entrepreneurs in the evaluation of several promising technologies; with their guidance, we select a subset of those technologies for presentation at a larger commercialization conference. This process has been effective not only in helping to move several of these technologies to the market, but also in creating a more entrepreneurial culture at ORNL.

All of these activities are contributing to the development of a national innovation ecosystem with the resources needed to leverage the federal investment in the national labs and accelerate the commercialization of new technologies in support of high-growth businesses.

Responses by Dr. Dan Arvizu

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
Subcommittee on Energy

Hearing Questions for the Record
The Honorable Cynthia Lummis

Oversight and Management of Department of Energy National Laboratories and Science Activities
Dr. Dan Arvizu

Response to House SST Energy Subcommittee Questions for the Record

QFRs from Chairman Lummis

1. ***What is your reaction to the recommendation of scaling back site office operations by providing more autonomy to lab contractors? What would this transition look like, and what steps or milestones would need to be in place along the way?***

From a historical perspective, it should be noted that Department of Energy site offices were first established largely before instant communication technologies revolutionized how geographically dispersed organizations can be effectively structured and managed. This might prompt some rethinking of the best systems and locations for DOE's oversight of National Laboratories.

Moreover, the Department's original Management & Operations (M&O) contracts specifically provided National Laboratories with the Federally Funded Research and Development Center (FFDRC) designation. As FFDRCs, the Laboratories would be trusted advisors of program direction to the Department, and would oversee technical direction of their own research and development activities.

As the National Academy of Public Administration (NAPA) review on DOE's management of the labs noted: "An underlying principle ... is to bring the FFDRCs more 'inside the fence' in their dealings with their federal sponsors. They are selected because of the expertise they bring to the table and are intended to be trusted advisors and partners with their sponsoring organizations." The NAPA report, however, found that today, "it was clear there is no uniform understanding of what that means and how that should translate into working relationships on the ground."

If DOE were to return to the original provisions laid out for FFDRCs, much of the technical oversight function could be scaled back, with M&O contractors again performing those functions designated in FFRDC language. Our National Centers could return to performing as National Centers were originally intended, and could provide expert guidance and integration support to the entire complex.

With regard to oversight of operations, the entire complex has been encouraged to secure outside, independent oversight of many internal functions. The most prominent example has been the encouragement by DOE that the Labs meet federal Occupational Safety and Health Administration (OSHA) standards, and achieve ISO Certification at their sites. Today, most every M&O has obtained ISO certification, yet few, if any, provisions in the corresponding M&O contracts have changed to fit this reality. Thus, there is a compounding and duplicative effect, with the Labs maintaining ISO Certification, while at the same time having to comply with disparate DOE Orders and Directives concerning those same issues. This is an example of the Department continuing to tell the contractors "what" to do, and again telling them "how" to do it.

Through this process a funding gap was also identified between current Lab budgets and the additional funds that will be needed to bring Lab facilities in compliance with OSHA requirements. DOE rules are not less stringent or encompassing, they are in most all respects just different. The projected costs would accrue from the necessity to change over to address the specifics of the OSHA standards, not to meet the same level of environmental and occupational safety. Accordingly, if the transition to established outside oversight of environmental and safety compliance is important and worthwhile, and we believe it is, it should be accompanied by the new funding that would allow it to be fully implemented. By having the Labs subscribe to both DOE and outside standards, the situation today is even more burdensome than having DOE apply its own, separate policies to the Laboratories.

2. ***A report issued earlier this year by the National Academies of Public Administration recommended that Congress direct the Secretary of Energy to engage an external commission for two years to perform an assessment of the strategic future of the national labs. This review would focus on whether DOE is sufficiently integrating the labs' capabilities and optimizing their value to the Nation. Would such a review be useful and why?***

A number of studies and reports have been completed concerning these important issues. It is notable that each confirms both the value of the National Laboratories and the soundness of the Government-Owned-Contractor-Operated (GOCO) model. It's doubtful two more years of review will provide worthwhile recommendations beyond those already documented. The need today is for implementation of the acknowledged reform measures, not yet one more study. In a practical sense, only DOE is in a position to effectively evaluate the duplication and integration functions across the Labs. Toward that end, Energy Secretary Moniz has acknowledged the Department needs to move beyond the "stovepipe" management systems in place today, and put in place a more dynamic, complex-wide strategic management structure. A number of the management changes announced by Secretary Moniz already are moving in that direction.

3. ***The report notes that labs conduct significant research through Work For Others (WFO) programs, and that these programs vary contract by contract and across agencies. How much***

of the work at your labs is done through WFO programs and how widely do the terms differ across projects?

As a matter of strategy and policy, NREL sees our Work for Others as one more way to leverage our expertise and capabilities to further serve our mission. In that sense our WFO program advances the broader goals of the Laboratory, DOE and the nation – by conducting vital research that the private sector cannot undertake on its own. At the same time, this strategic focus for our WFO work prevents us from extending our reach into less vital research pursuits and avoids potential distractions from our essential R&D objectives.

Our Work for Others (private and public entities other than DOE) in FY13 is $48 million, and comprises 14 percent of our overall budget. This includes both our WFO projects (federal and non-federal) and our Cooperative Research and Development Agreement (CRADA) projects.

These numbers underscore our commitment to making the Laboratory a valuable asset for public and private entities which share our abiding interest in clean energy research – at the same time fully meeting the needs of our primary sponsor, DOE's Office of Energy Efficiency and Renewable Energy (EERE). This effort has resulted in more than a doubling of the work performed for entities outside of EERE. The NREL research portfolio for all entities other than EERE grew from 9 percent of our total budget in 2009 to nearly 25 percent in 2012. We manage our WFO program as an effective way to amplify NREL's beneficial impact for the nation, and strengthen our role as the nation's premier clean energy R&D institution.

The Laboratory works directly with both suppliers and end users of new technology. This provides additional return on the federal investment by assisting those who are actively moving the market for new technology forward. This includes working with equipment manufacturers to validate technology performance, and with users to effectively deploy, integrate and demonstrate new technologies at work in the field. This enhances the expertise of Laboratory researchers and keeps us closely connected to real-world markets and industries – all of which helps guide future technology R&D decisions.

NREL's early-stage research for the DOE Office of Science has nearly tripled in three years – efforts which have improved the understanding of the science underlying a variety of mission areas.

Key partners (beyond EERE) in later-stage R&D are other federal agencies, and of course, the commercial sector. Our work with federal agencies beyond DOE is maximizing the benefits of new, clean energy technologies and reducing the investment risk across the federal government. The Department of Defense looks to NREL as a strategic technical resource as it addresses energy security issues at both fixed installations and forward operating bases. NREL provides primary support to the Defense Department on large-scale energy technology demonstration projects, on deploying base-level renewable energy projects, and on helping the services move toward their longer-term energy targets. Results from each of these initiatives is providing a valuable knowledge base for replicating these successes at bases around the world.

4. ***Dr. Mason's testimony endorses expanded use of DOE's new "Agreements for Commercializing Technology," or ACT mechanism, noting that it makes it easier for private companies to partner with national labs.***

   Approximately how many WFO, CRADA, and ACT agreements is NREL a partner to? In the interest of greater transparency, would you support making the basic information related to these agreements publicly available? Related to this, and given the labs' increasing flexibility in negotiating licensing agreements with industry, should the basics of such IP agreements be made public?

NREL has 328 active partnerships this fiscal year, including 124 CRADAs and 204 WFOs, which include 74 agreements with federal partners and 130 agreements with private and public non-federal partners. NREL has more Cooperative Research and Development Agreements (CRADAs) than any other National Laboratory, including those several times its size. We have not utilized the provisions of ACT to date.

Because understanding the needs of and working with a broad cross section of the clean energy sector is a vital component of our overall mission, CRADAs have become the most important partnership mechanism for realizing the market impact of our R&D. We continue to focus on partnerships that build the science foundation of the laboratory, accelerate market-relevant innovation toward commercial outcomes, and provide relevant and insightful analysis for energy decision-makers.

It's important to note that for every dollar of federal investment in our WFOs and CRADAs, we are attracting an average of six dollars from our outside partners – a positive leveraging of limited government resources for maximum results. Our experience suggests that existing mechanisms for partnering are working, though giving the Laboratories greater flexibility in contracting would make them work better. As for ACT, it could be a more useful instrument for partnering if it was redefined to be used more broadly, especially as a tool to partner with government entities.

One overriding principle for success in this area is that partnering agreements must accommodate the needs not only of the Laboratory and the government, but also our private partners. And private industry must often maintain confidentiality about its pre-commercialization work.

We do support transparency for aggregate information about our overall CRADA program. Information about the impact CRADAs are having on the Laboratory, and broken down by industry and technology sector, can be useful in assessing the direction and metrics around a National Laboratory's CRADA portfolio. We additionally make public reports on our CRADAs at the conclusion of each project.

It is the private sector's need to keep material information proprietary which limits our ability to disclose specific information about individual CRADAs while they are underway. Experience suggests, and our knowledge of the relevant industries confirms, that the Laboratory would see a significant decline in CRADA activity if we were required to divulge specific information about the company, its technology interests, and the details of our work with them. Premature disclosure of propriety information would harm the economic interests of our partners – a fact that undoubtedly would preclude many from ever engaging in what would otherwise be productive cooperative research with the Laboratory.

A number of initiatives have been undertaken to more clearly explain the partnering process, and make it easier for private concerns to gain access to technologies born in the National Laboratories. The Technology Commercialization Portal http://techportal.eere.energy.gov/ is just part of those efforts. Currently, DOE is completing a comprehensive set of guidelines for licensing IP from the National Laboratories, which are planned to be publicly released later this year.

As for "making it easier for private companies to partner with National Laboratories," the entire system will be improved by giving the Laboratories greater independence and flexibility in contracting. In this instance, as well as others, the guiding principle should be that the Department decide "what" to do, and the Laboratory contractor should decide "how" best to do it.

5. ***You note that "duplication" is not always detrimental as it can stimulate competition. How do we best balance the competitive synergies resulting from dual research efforts, with the need to minimize waste and duplication? Would restructuring and re-empowering of lab contractors help reduce or potentially increase such overlap?***

The history of National Laboratories confirms that competition over ideas within the complex works to drive innovation, and provide more technology pathways for resolving a scientific challenge. To address our nation's greatest research needs, we should identify the best minds and the best capabilities from across the Laboratory complex, and fit them together to achieve the optimum synergies our Laboratories can provide. To do this, DOE and the Laboratories must be able to look beyond the "stovepipes" of programs and budgets, and define research direction and goals in truly cross-cutting ways.

At that point, the Laboratories themselves are best equipped to provide the technical integration needed to achieve the research objective, with decisions guided by the established missions of each Lab.

Toward this end, there inevitably will exist some duplication of roles and capabilities within the National Laboratory complex. It should be remembered that the scientific standard of outside peer review means that some duplication of functions and expertise is necessary, and in fact, vital to achieving successful research outcomes. The fact that the highest levels of expertise exist in the Laboratories poses a challenge in and of itself. Often then the people best qualified to judge a solicitation are the same researchers who are preparing a response to that solicitation. DOE's Office of Science has long understood this, and has employed a process whereby the scientific community within the Labs can assess the value of ideas, with the most valuable proposals ultimately rising to the top. Here again, this requires empowering the National Laboratories to work directly with the Department to play a greater role in advising and guiding the broader research portfolio.

6. ***The report calls for eliminating the current 8% cap on Laboratory Directed Research and Development (LDRD) funding-flexible resources that labs can direct to projects of their***

choosing. However, the total LDRD across the labs was just 4.76%. The highest labs were Los Alamos (6.93%) and Sandia (6.69%). It appears the labs are not hitting the 8% cap.

Please describe how your lab utilizes LDRD funding. Is there a risk that eliminating the cap might result in "laboratory drift" away from Departmental-driven prioritization of science?

For NREL, our Laboratory Directed Research and Development (LDRD) program is a way to tap into the unique expertise of our scientists and engineers, and apply it in new, innovative ways to advance the Laboratory's established research mission. LDRD is an important addition to our overall research capability, providing a flexible mechanism to establish proof of principle for new concepts, and one that has yielded a number of valuable advancements in technology.

Across the National Laboratory complex, the level and role of LDRD varies considerably, and as a result, the 8 percent cap is not uniformly relevant. NREL's program has not been constrained by the cap. The LDRD budget for some labs is greater than the entire research budget for others, and at times LDRD has been used to move a lab's research agenda in directions outside its core mission.

LDRD is financed through assessments to the budgets of each individual, federally supported research program in the Laboratory. Therefore, increasing the overall LDRD expenditures can increase the cost of conducting other research. LDRD offers us the ability to have some of our smartest researchers come up with and act on their own great ideas for novel research. Clearly, that's a plus, but the financing mechanism means it forces difficult choices between other competing needs. Alternative funding mechanisms could be explored that would put all the Labs on a more even playing field, and could guard against the "laboratory drift" referenced in the question, by better ensuring that LDRD programs remained focused on the mission of the Laboratory in question. A more workable approach would be to provide a base level of discretionary funds to every lab for advancing its own best science and technology ideas.

QFR from Rep. Veasey

1. ***It seems the vast majority of federally licensed patents developed in our national labs never make it to market. What do you attribute that to, and what role do you see the private sector playing in helping to commercialize federally licensed patents?***

The key to success in this regard are Laboratories which truly understand their technical domain, and in having them conduct R&D that is relevant to market needs. Achieving both is fundamental to NREL's mission. We use our technical fluency to make pertinent research decisions based on market opportunities.

As a result, it is noteworthy that 43 percent of NREL's patent portfolio is actively used to support our partnership activities. These patents are transferred in a license or option, or are included as pertinent technology and research underpinning a CRADA.

In discovery science, work frequently is conducted without knowing what market opportunities might ultimately exist. That's why this basic research is higher risk, yet can at times yield breakthroughs that are so exciting, so unexpected.

At NREL we use all the tools of both fundamental and applied science to create clean energy solutions essential to our Lab's mission. We emphasize market relevancy in everything we do. We don't make the end products or systems – private industry does that. But we do work with industry to ensure the advanced technologies we develop are commercialized to benefit the nation.

Much is involved before a patent can yield a commercial product. We see time and time again that the technical challenges for a private concern don't end when they license a patent. Indeed, in many cases, the technical challenges of manufacturing at sufficient scale, and then bringing the technology to market for deployment, can be as critical and daunting as the challenges were to originally develop the patented technology.

We have learned that there is no bright line where R&D ends and commercialization begins. The role and goal of an applied science laboratory like NREL must be to reduce the risk of an advantageous innovation to the point where the private sector has the confidence it needs to make the investment that is needed to bring it to market.

Appendix II

Additional Material for the Record

SUBMITTED LETTER FOR THE RECORD FROM
THE SECRETARY OF ENERGY, DR. ERNEST MONIZ

The Secretary of Energy
Washington, D.C. 20585

July 10, 2013

The Honorable Cynthia Lummis
Chair, Subcommittee on Energy
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, DC 20515

The Honorable Eric Swalwell
Ranking Member, Subcommittee on Energy
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Lummis and Ranking Member Swalwell:

I am writing in response to your June 26, 2013 letter regarding the National Laboratories. Thank you for the opportunity to follow-up on my June 18th testimony before the Committee to discuss science and technology priorities for the Department of Energy (DOE). This letter is intended to expand further on some of the issues discussed in that hearing, specifically with respect to the role of the DOE National Laboratories.

The recent report, *Reimagining the National Labs in the 21st Century Economy*, is the latest in a series of reports by respected third party organizations addressing the role of the National Laboratories in the U.S. innovation process. The National Academy of Public Administration and the National Academy of Sciences also have reported on National Laboratory issues. All of these reviews share several common perspectives. Most important, I am pleased to see that there is consensus that the Department's National Laboratory System is a key element in the U.S. Innovation Enterprise. The National Laboratories have world class experimental facilities and personnel that foster new technologies and can lead to new industries and new jobs. The National Laboratories are part of the backbone of the American physical science research enterprise, serving nearly 30,000 scientists from universities, industry, and labs each year, and play a significant role in the education of the next generation of America's scientists and engineers. It is imperative that these assets be managed in a manner that maximizes the return on taxpayers' investment.

This letter outlines the general approach I intend to pursue in strengthening the relationship between the Department and its National Laboratories to enhance the value of this system to the nation. Any new actions to change the strategic direction of the National Laboratories should not only have the full participation and support of the top leadership at the Department but also reflect the engagement of the National Laboratory community. As Secretary, I plan to set the agenda and lead this dialogue with the clear understanding that the lab leadership are strategic partners. In my first six weeks on the job, I was able to meet with the lab directors three times in person or by video conference.

Two recurring themes in all studies of the National Laboratory system are the need to improve the strategic direction of the Laboratories and the need for the Department to develop an enterprise-wide view of the National Laboratory system. I plan to formalize the strategic dialogue process by establishing a National Laboratory Policy Council that I will chair. It will include relevant senior leadership in the Department along with the Executive Committee of the National Laboratory Directors Council. The Policy Council will advise me on strategic directions for the Department's science and technology programs across the board and on the Labs' critical role in advancing the Department's missions and the nation's innovation ecosystem. The Department recently initiated the next iteration of its strategic plan, required by the Government Performance and Results Modernization Act, and I will be soliciting direct input from the Laboratory Directors in this process. The Council also will help me to shape an enterprise-wide perspective on new policy initiatives as part of the Quadrennial Energy Review.

Aligning the strategic direction of the National Laboratories with the strategic direction of the Department requires that the Department articulate a comprehensive vision of its science and technology missions. I have long believed that aligning the Department's basic research and applied energy R&D activities under a single Under Secretary is a needed first step. I am pleased to see that this concept has been endorsed in the "Reimagining" report as well as in other studies.

Laboratory operations also will be a priority area for improvement. The current Government-owned Contractor-operated (GOCO) arrangement between the Department and the National Laboratories has proved its value for over 60 years throughout major changes in national priorities. Improvements in how this core management concept is implemented today will be a focus of the Policy Council and the Secretary of Energy's Advisory Board (SEAB).

The Department is accountable to the President pursuant to his policies and directives as well as to Congress under applicable laws and regulations. As owners it is our responsibility to assure that the National Laboratories are operating in full compliance with these requirements. While I generally support efforts to move toward performance-based oversight and outcome-based evaluation, we need to strike the appropriate balance between providing operational flexibility to the Labs and the Department's responsibility and accountability to the President, the Congress and the taxpayer. Progress has been under way in this area. I understand that the National Laboratory Directors identified 20 specific areas for improvement, and the Department has taken action on 14 of these issues, with actions pending on 2 others, and an agreement to defer the remaining 4 items. But I recognize the need to do more. I plan to establish a new organizational unit, the Laboratory Operations Board, that will provide an enterprise-wide forum to engage the Laboratories in finding additional opportunities to improve effectiveness and efficiency.

Two key issues affecting National Laboratory operations are the implementation of the Laboratory-Directed Research and Development (LDRD) program and the Work for Others (WFO) program. Although much of the current focus is on the level of the LDRD funding set aside, LDRD funding should not be an open-ended entitlement. Instead, I believe that the dialogue between the Department and the National Laboratories needs to first focus on the scope and prioritization of activities to be supported under LDRD programs and measures to enhance the research outcomes of LDRD-funded activities. Once these issues are further defined, the issue of appropriate level of LDRD funding can be addressed in a more thoughtful manner.

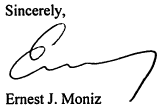
As stated in their titles, the National Laboratories are national assets. While they are intended to advance the missions of the Department of Energy, the Department also should be a responsible steward of these assets in instances where they can serve other national objectives. Due to their unique capabilities, the National Labs can uniquely provide work for other agencies. In

particular, national security work carried out at the National Laboratories has expanded greatly in the past decade, and Departmental policies have not kept pace. I understand that there has been an improvement in length of time for Departmental approvals for this work, and I intend to collaborate with the Laboratory Directors to find ways to make the process of assigning national security work to the National Laboratories more efficient. The pilot program implementing Agreements for Commercializing Technology represents one approach to reforming the process and merits further review and discussion.

The National Laboratory system has been and remains a critical contributor to the U.S. innovation enterprise. I reject the notion stated in the report that the system is "largely running on autopilot," but I do acknowledge that the role of the Laboratories in the innovation process can be further enhanced. This is not a simple matter. The notion of "moving technology to market" does not adequately recognize the increasingly complex nature of the innovation process and the importance of the "innovation ecosystem" in which a laboratory operates. I intend to recruit a Departmental technology transfer coordinator who is deeply familiar with technology innovation and commercialization.

I plan to be actively engaged with the National Laboratory Directors in developing specific follow-up actions in the areas I have outlined in this letter. I view this as a process of continuous improvement. I look forward to continued dialogue with the Subcommittee as we proceed down this path. If you have any questions or would like to engage further on this topic, please contact me or Christopher Davis, Deputy Assistant Secretary for Congressional Affairs.

Sincerely,



Ernest J. Moniz

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